

RECREATION FLOW PREFERENCE REPORT

Chattahoochee River National Recreation Area

*Prepared for
National Park Service
1978 Island Ford Parkway
Atlanta, Georgia 30350*

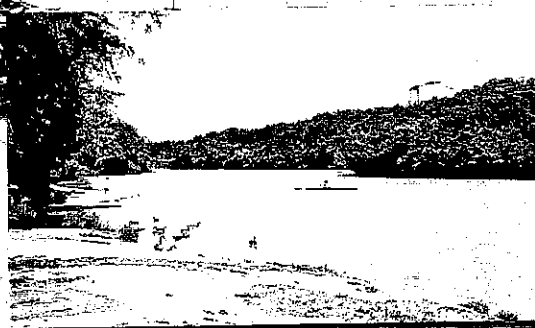
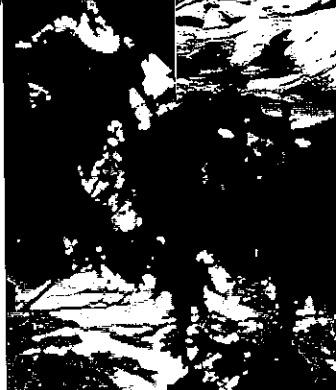
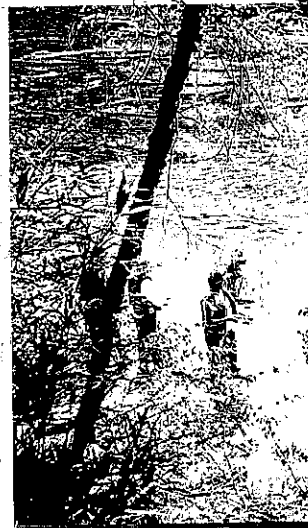
Prepared by



CH2MHILL

August 2000

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1 Section 1 – Introduction

2 Objectives

3 The purpose of this study is to identify recreation user preferences for various flow regimes
4 on river segments within the Chattahoochee River National Recreation Area (CRNRA). This
5 information is being developed to assist the National Park Service (NPS) in evaluating the
6 potential impacts of a water allocation formula for the Apalachicola-Chattahoochee-Flint
7 (ACF) River Basin on riverine recreation use in the CRNRA. Once the states of Florida,
8 Alabama and Georgia have negotiated an allocation formula, the NPS will have an
9 opportunity to comment on an Environmental Impact Statement (EIS) to be finalized by the
10 Mobile District, Army Corps of Engineers (Corps).

11 The objectives of this study are to:

- 12 • Evaluate recreation user preferences for various flow regimes on segments of the
13 Chattahoochee River accessed via the CRNRA.
- 14 • Coordinate with the Corps to gather hydrologic data on the “time of travel” between
15 Buford Dam and existing U.S. Geological Survey (USGS) monitoring gauges at Norcross
16 and Roswell.
- 17 • Provide stage and discharge information for each of the eight (8) flow observation points
18 and hourly flow data for the period of record on the Chattahoochee River at Buford
19 Dam.
- 20 • Estimate the percentage of time the preferred recreation flows are available per user
21 group under existing flow conditions. This analysis will eventually be used to compare
22 acceptable recreation flow days per user group under the “proposed allocation
23 formula.”

24 Study Area

25 Located northwest of the City of Atlanta, the CRNRA extends along a 48-mile segment of
26 the Chattahoochee River. The northern extent of the study area is Buford Dam, which
27 impounds Lake Sidney Lanier; the southern extent is the river’s intersection with Cobb
28 Parkway approximately 0.5 mile downstream of Interstate 75 (Figure 1-1). The study area
29 for the hydrologic analysis extends from Buford Dam (River Mile [RM] 348.1) south to the
30 Chattahoochee River confluence with Peachtree Creek (RM 310.8). The study area also
31 includes Bull Sluice Lake, the impoundment associated with Morgan Falls Dam (RM 313.2).
32 The channel slope through the project area is about 1.8 feet/mile except for a steeper reach
33 starting about 4.5 miles downstream of the Morgan Falls Dam. The slope in this reach is
34 about 8.8 feet/mile. Flow in this reach of the Chattahoochee River is highly regulated by
35 operation of the Buford Dam and to some extent by operation of the Morgan Falls Dam.

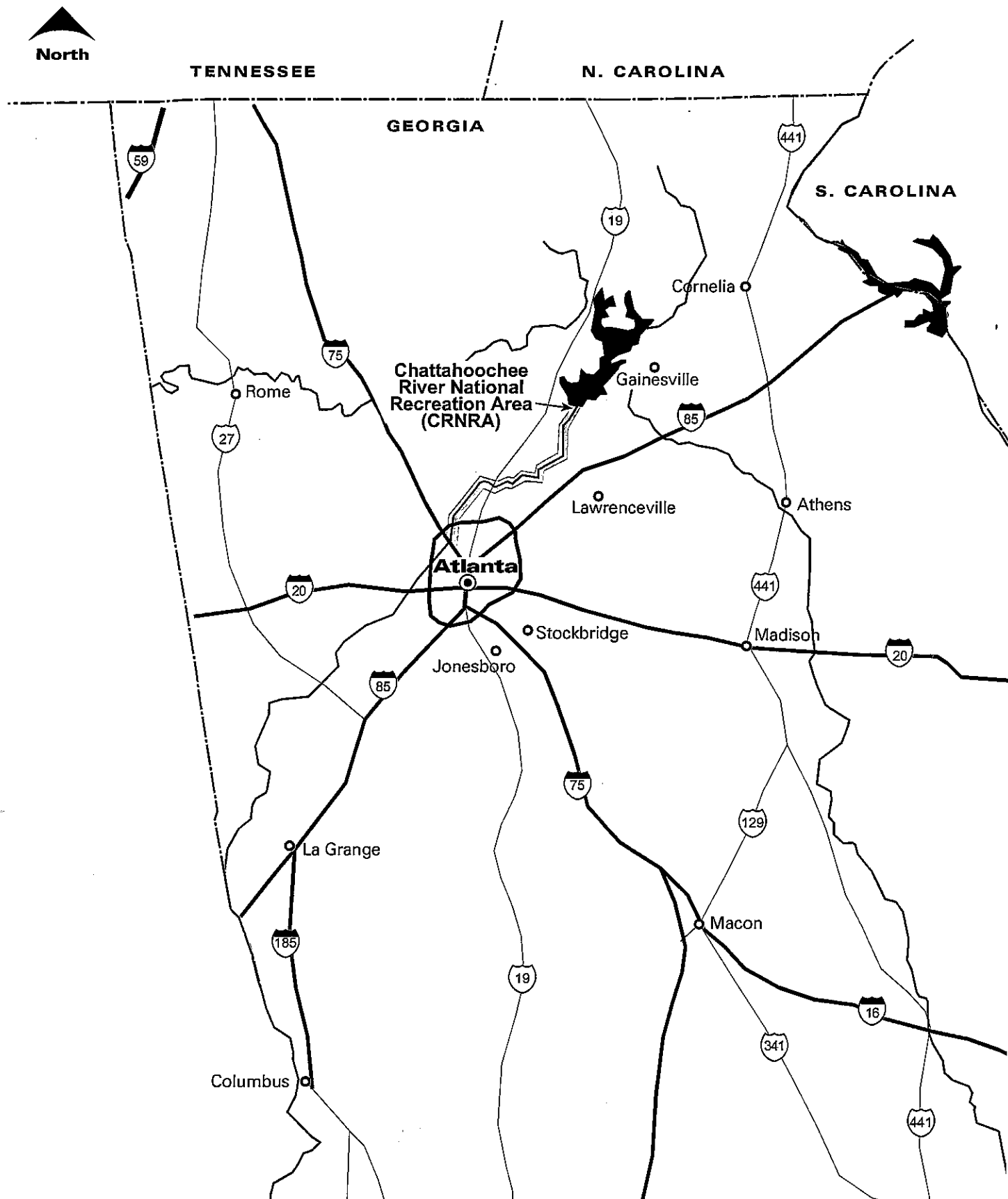


Figure 1-1
CRNRA Location Map
 CRNRA Recreation Flow Preference Study

1 The CRNRA itself is comprised of a series of 14 park units within four counties: Gwinnett
2 County, Forsyth County, Fulton County and Cobb County (Figure 1-2). In addition to
3 providing recreational activities such as fishing, hiking, picnicking, and boating, the park
4 contains a wide variety of natural habitats, flora and fauna, nineteenth century historic sites,
5 and Native American archeological sites. The CRNRA received approximately 2.9 million
6 visitors in 1999, with the majority of these visitors participating in land-based recreation
7 activities. Summer is the highest use period for recreation, though the river is a popular
8 fishing destination year-round. While the park is open from dawn to dark, overnight
9 camping is not permitted.

10 **Methodology**

11 An expert user group approach was used to evaluate flow preferences among different
12 recreation groups that access the river via the CRNRA. Expert users attended one meeting
13 to provide the NPS with feedback on their recreation flow preferences. After a brief
14 introduction, a video of eight observation points between Buford Dam and Interstate 75 was
15 presented depicting the river at three approximate flow levels (low, medium, and high).
16 Attendees were asked to watch the video presentation and rate each flow level on a scale
17 ranging from poor to excellent as to how the flows would affect their recreation activity.
18 Participants completed an evaluation form after viewing the videotape and discussing the
19 flow levels. The expert users were then engaged in discussion regarding their recreation
20 flow needs and current river flow conditions.

21 The hydrologic analysis section of the study evaluates Chattahoochee River streamflow data
22 recorded during the study period (May 17—May 19, 2000). The data were incorporated in a
23 hydraulic model to estimate streamflow for each of the eight video observation points.
24 Rating curves were also developed for each of the eight points. These curves along with the
25 hydrographs describe the relationship between streamflow, stage, and velocity.

26 The proposed allocation formula was not available when this study was completed.
27 However, the study results in conjunction with the proposed formula can be used by NPS at
28 some future time to compare acceptable recreation flow days per user group.

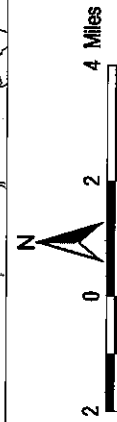
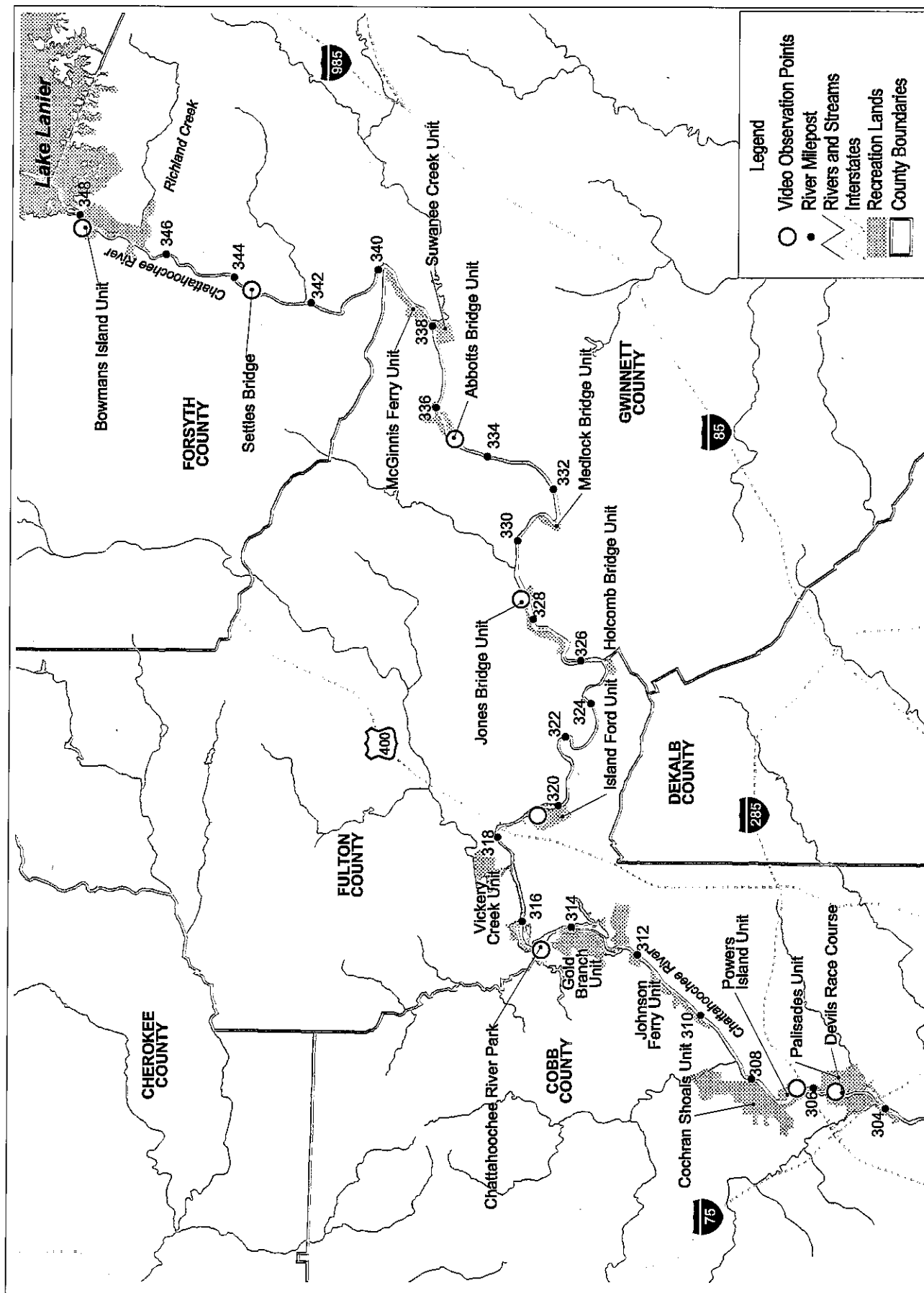


Figure 1-2
Video Observation Locations
CRNRA Recreation Flow Preference Study

Section 2 – Expert User Groups

Expert User Groups

Three groups of recreation expert users were identified by National Park Service staff, local recreation groups, and recommendations from local recreation shops (Table 2-1). The users were initially contacted by telephone, with follow-up by letter or e-mail. A total of 23 persons participated in the meetings, which were organized by recreation activity. All of the main recreation activities that regularly occur on the Chattahoochee River were represented at the meetings. NPS staff attended each meeting to observe and answer any questions that arose.

TABLE 2-1
Expert User Groups and Meeting Dates

Group	Recreation Activity	Meeting Date
Group 1	Boat Fishing	June 12, 2000
Group 2	Float or Wade Fishing	June 5, 2000
Group 3	Kayaks, Canoes, Rowers & Rafters	June 7, 2000

Recreation users were grouped together if they shared similar recreational flow requirements. For example, Group 1 consisted of persons accessing the river via powerboats. These participants typically benefit from a concrete boat launch. Float fishing and wade fishing were combined into Group 2 since each accesses the river by foot. Group 3 represents those recreation users accessing the river by a non-motorized boat such as a kayak, canoe or rowing shell. However, there was some mixing of recreation activities at the actual meetings to accommodate the participants' schedules.

Canoeing or kayaking was the primary recreation activity represented at the meetings, with 35 percent of all participants listing it as the main way they accessed the CRNRA (Table 2-2). The participants were members of the Georgia Canoeing Association and private citizens. Wade fishing and tube fishing was next with 30 percent representation. Members of both the Upper Chattahoochee and Atlanta Chapters of Trout Unlimited attended the meetings, as well as area fly fishing guides. Three individuals represented powerboat fishing or rowing as their primary recreation activity. Rowers from the St. Andrews Rowing Club and the Atlanta Rowing Club attended the meetings and represented 13 percent of the participants, the same percentage represented by the power boat users present. Staff of the Upper Chattahoochee Riverkeeper and the Chattahoochee Nature Center participated in the expert user groups. Two of the expert users (9 percent) cited rafting as their primary recreation activity.

TABLE 2-2
Description of Expert User Group Members Primary River Recreation Activity

Primary River Recreation Activity	Expert User Group Members	Percent of Group
Canoeing/Kayaking	8	35%
Wade/Tube Fishing	7	30%
Powerboat Fishing	3	13%
Rowing	3	13%
Rafting	2	9%
Total	23	100%

1

2 Table 2-3 describes how many visits per month each expert user group member typically
3 makes to the CRNRA. Eight of the expert users (35 percent) visited less than 5 times per
4 month, while an additional 35 percent visited between 6 and 10 times per month. Six of the
5 participants visited the CRNRA more than 10 times per month. These included persons
6 who earn their living by spending large amounts of time on the river, such as fly fishing
7 instructors, boat fishing guides, river tour guides, and scientists.

TABLE 2-3
Expert User Group Members - Visits per Month to the CRNRA

Visits Per Month	Expert User Group Members	Percent of Group
No Answer	1	4%
0 to 5	8	35%
6 to 10	8	35%
More than 10	6	26%
Total	23	100%

8

9 Expert user group participants tended to access the CRNRA via four main access points
10 depending on their recreation activity (Table 2-4). Persons wade or tube fishing accessed
11 the river primarily at Jones Bridge Unit or Island Ford Unit because of the quality of fishing
12 along this segment. These users also mentioned utilizing portions of the river below
13 Morgan Falls such as Cochran Shoals and Palisades; however, declining fishing quality in
14 the 1980s caused a decline in its popularity. Based on expert user group discussions, fishing
15 conditions along this segment of the CRNRA appear to be improving. It was suggested that
16 the perceived improvements are thought to be associated with fish habitat and increased
17 spawning opportunities. The Chattahoochee River Park was used mostly by rowers and
18 those in canoes / kayaks to access the river, with one expert user group participant using
19 this location to launch a power boat for fishing. The Johnson Ferry Road and Powers Island
20 Unit areas were identified as river access points by rafters and paddlers (canoes / kayaks)
21 destined for the Devils Race Course, located just downstream.

TABLE 2-4
Expert User Group Members - River Access and Preference

River Location	River Mile	River Access ¹	Percent ²	Favorite Place ³	Percent ²
Bowmans Island Unit	348	0	0%	1	4%
Buford Trout Hatchery	346.5	1	4%	0	0%
Settles Bridge	343.5	0	0%	2	9%
Abbotts Bridge Unit	335	1	4%	0	0%
Medlock to Highway 20	331-346	0	0%	1	4%
Jones Bridge Unit	328.5	6	26%	6	26%
Eves Road (Island Ford Unit)	320.5	1	4%	0	0%
Island Ford Unit	320	3	13%	5	22%
Chattahoochee River Park / Bull Sluice Lake	315	6	26%	2	9%
Johnson Ferry Unit	311	1	4%	0	0%
Cochran Shoals Unit	307	0	0%	1	4%
Powers Island Unit / Paces Mill	306.5	3	13%	1	4%
Powers Ferry / Devils Race Course	305.5	1	4%	2	9%
East Palisades Unit	305	0	0%	1	4%
The "Cliffs"	305	0	0%	1	4%
Total		23		23	

Notes:

¹ This column indicates how many of the expert users listed each location as the place where they typically enter the Chattahoochee River, either via a boat launch or wading from the bank.

² Percentage of total responses; percentages do not total to 100% due to rounding.

³ This column indicates how many of the expert users listed each location as their favorite place in the CRNRA to engage in recreational activities.

1 Recreation Flow Video

2 A visual time series depicting the change in river channel characteristics under a variety of
3 flow regimes was videotaped at eight (8) different locations along the CRNRA (Figure 1-2).
4 The videotaped information was collected based on the scheduled release of water from
5 Buford Dam. The goal of the process was to develop visual media representing the widest
6 range of flows at the eight observation points.

7 A pre-taping reconnaissance trip of potential observation points was conducted to
8 ensure appropriate video staging locations. The observation points were then chosen in
9 consultation with the NPS and based on river access facilities, general use information, and
10 fishing reputation. Once the final points were identified, the flow release schedule for
11 Buford Dam was reviewed. To facilitate efficient videotaping, the Corps made a special
12 release at 7 a.m. on May 17th for the study. While the majority of the flows were taped on
13 May 17th, a few segments were taped on May 19 as noted in Table 2-5.

TABLE 2-5
Description of Actual Video Flow Observations

Location	Flow Type	Date of Video Shot	Time of Video Shot	Flow Rate (cfs)
Bowmans Island Unit				
	Low	17-May	7:04 a.m.	653
	Medium	17-May	8:04 a.m.	8,440
	High	17-May	9:12 a.m.	8,630
Settles Bridge				
	Low	19-May	10:30 a.m.	578
	Medium	17-May	10:03 a.m.	5,400
	High	17-May	9:33 a.m.	6,750
Abbotts Bridge Unit				
	Low	17-May	10:13 a.m.	1,670
	Medium	17-May	11:32 a.m.	3,545
	High	17-May	12:41 p.m.	3,280
Jones Bridge Unit				
	Low	19-May	11:33 a.m.	900
	Medium	17-May	12:43 p.m.	1,990
	High	17-May	2:15 p.m.	2,990
Island Ford Unit				
	Low	17-May	2:21 p.m.	1,450
	Medium	17-May	3:33 p.m.	1,600
	High	17-May	4:41 p.m.	2,150
Chattahoochee River Park				
	Low	17-May	3:29 p.m.	1,490
	Medium	17-May	5:27 p.m.	2,080
	High	17-May	7:08 p.m.	2,500
Powers Island Unit				
	Low	17-May	2:15 p.m.	785
	Medium	17-May	7:13 a.m.	785
	High	17-May	8:14 a.m.	785
Palisades Unit / Devils Race Course				
	Low	19-May	12:42 p.m.	770
	Medium	17-May	10:15 a.m.	770
	High	17-May	11:01 a.m.	770

A team of six spent May 17th alternating between the locations shown on Figure 1-2 videotaping approximately 15 minutes at three different flows, for a total of 45 minutes of video for each observation point. This video tape was then edited to reflect 30 seconds of the best representation possible of low, medium, and high flows at each of the eight observation points. A map of each observation point location and an onscreen text description of the current flow were also added during the editing process.

Observation Point Descriptions and Flow Times

The following information describes the eight observation points selected. The location of these points is shown in Figure 1-2. Six of the eight locations are CRNRA park units, while Settles Bridge and the Chattahoochee River Park are maintained by local municipalities.

- **Bowmans Island Unit:** Located just north of milepost 348, this point characterizes the start of Bowmans Island Shoals. The shoals start approximately one mile from the base of Buford Dam and extend for a mile. At this time, the NPS does not operate any developed facilities at Bowmans Island. Lower Pool Park, operated by the Army Corps of Engineers, has a boat ramp, handicap access, picnic tables, water and restrooms.
- **Settles Bridge:** The actual bridge (located between milepost 344 and 343) is closed. There are no developed recreation facilities at this location; however, it is a popular fishing destination. This area is accessed by taking Suwanee Dam Road to Johnson Road on the eastern side of the river.
- **Abbotts Bridge Unit:** Located just north of milepost 335, this is the first boat ramp available for users downstream of Bowmans Island Unit. Facilities at this location include a boat/canoe/raft launch, picnic tables, and restrooms.
- **Jones Bridge Unit:** Jones Bridge Unit is located between mileposts 329 and 328. The area from Jones Bridge to Holcomb Bridge (approximately 4 miles) is a prime location for canoeing and fishing, especially along the Jones Bridge Shoals. Below Jones Bridge is a good place to cross the river on the shoals when the water is low. Facilities at this location include a concrete boat ramp, a launch for canoes and rafts, picnic area with grills, large open grassy recreation area, hiking trail, wheelchair accessible viewing deck, restrooms, and two parking areas.
- **Island Ford Unit:** Island Ford Unit is located at milepost 320. Local fisherman agree that some of the best fly and live bait fishing can be done from the shoals along this section of the river. Access via Island Ford Road off of Roberts Drive. Facilities at this location include the CRNRA Headquarters building and bookstore, canoe/kayak ramp, hiking trail, Fallen Branch Shelter, Sam Hewlett Field with picnic tables and grills, wooden deck for river viewing, restrooms, telephone, and 3 parking areas.
- **Chattahoochee River Park:** This popular park is operated by Fulton County Parks and Recreation and is well used. The Atlanta Rowing Club operates from this location and offers courses in rowing. Facilities include a boat/canoe/raft launch, picnic tables, hiking trail, and playground.
- **Powers Island Unit:** Powers Island Unit lies directly across the river from Cochran Shoals Unit and is a popular put-in for canoeists and rafters. Good trout fishing is

1 available along Cochran Shoals, which can be waded during low water. Higher flows
2 require a float tube or boat. There is also a slalom course about 100 yards long on the
3 eastern side of Powers Island. Chattahoochee Outdoor Center operates a rafting
4 business from this location that includes raft rentals, shuttle service and concessions.
5 Facilities include 20 slalom gates, a hiking trail, a canoe and kayak launch on the east
6 bank of Powers Island, and a raft launch from the west bank of the island.

- 7 • **Palisades Unit / Devils Race Course Shoals.** Located on both sides of the river, the
8 Palisades Unit provides hiking trails, an Overlook observation deck, and access to the
9 Devils Race Course Shoals. Slalom kayak gates are provided seasonally at the Shoals and
10 are taken down during the summer months to facilitate ease of passage by rafters.

11 Buford Dam is owned by the Army Corps of Engineers and is operated to provide peaking
12 power in the afternoon. The dam consists of three generating units. The smallest unit runs
13 continuously and provides a base flow release of approximately 600 cfs. The other two units
14 can provide combined releases up to 10,000 cfs and are used on an as-needed basis. During
15 normal conditions the Corps will operate the generators for 4 hours. However, current
16 operation of the dam is restricted to 1 to 2 hours per day due to existing drought conditions.

17 Morgan Falls Dam is the only other dam facility located in the project area. It is owned by
18 Georgia Power Company and is operated as a run of river project above a minimum release
19 rate of 1,000 cfs. Morgan Falls impounds Bull Sluice Lake, a popular location for rowing
20 and fishing along the CRNRA.

21 For the purposes of this project, the Corps made a special release at 7 p.m. on May 17, 2000.
22 Table 2-5 describes the actual flows captured on the video tape based on data provided by
23 the Corps and the Georgia Environmental Protection Division (EPD).

Section 3 - Hydrologic Analysis

Description of the Study Area

The study area for the hydrologic analysis extends from Buford Dam (RM 348.1) south to the Chattahoochee River confluence with Peachtree Creek (RM 310.8), just south of the CRNRA. The study area also includes Bull Sluice Lake, which is controlled by Morgan Falls Dam (RM 313.2). The channel slope through the project area is about 1.8 feet/mile except for a steeper reach starting about 4.5 miles downstream of the Morgan Falls Dam. The slope in this reach is about 8.8 feet/mile. Flow in this reach of the Chattahoochee River is highly regulated by operation of the Buford Dam and to some extent by operation of the Morgan Falls Dam. Buford Dam is owned by the Corps and is operated to provide peaking power in the afternoon. Release for Buford Dam is between 600 and 10,000 cfs and is highly dependent on water availability. Current operation of the dam is restricted due to existing drought conditions. The Morgan Falls project is owned by Georgia Power Company and is operated as a run of river project above a minimum release rate of 1,000 cfs. The study area is shown in Figure 3-1.

Methods of Analysis

Chattahoochee River streamflow data recorded during the study period were routed through an approximate hydraulic model to estimate streamflow hydrographs at each of the eight video observation points. Rating curves were also developed for each of the eight observation points. These curves describe the relationship between streamflow, stage, and velocity.

Data Sources

Provisional fifteen-minute flow and stage data were obtained from the USGS for the Chattahoochee River gauges listed in Table 3-1.

TABLE 3-1
USGS Gauging Station Description

Number	Description	Location	Drainage Area
02334430	Chattahoochee River at Buford Dam near Buford, GA	RM 348.1	1,040 mi ²
02335000	Chattahoochee River near Norcross, GA	RM 330.8	1,170 mi ²
02335450	Chattahoochee River above Roswell, GA	RM 320.6	1,220 mi ²
02336490	Chattahoochee River at SR 280 near Atlanta, GA	RM 298.8	1,590 mi ²

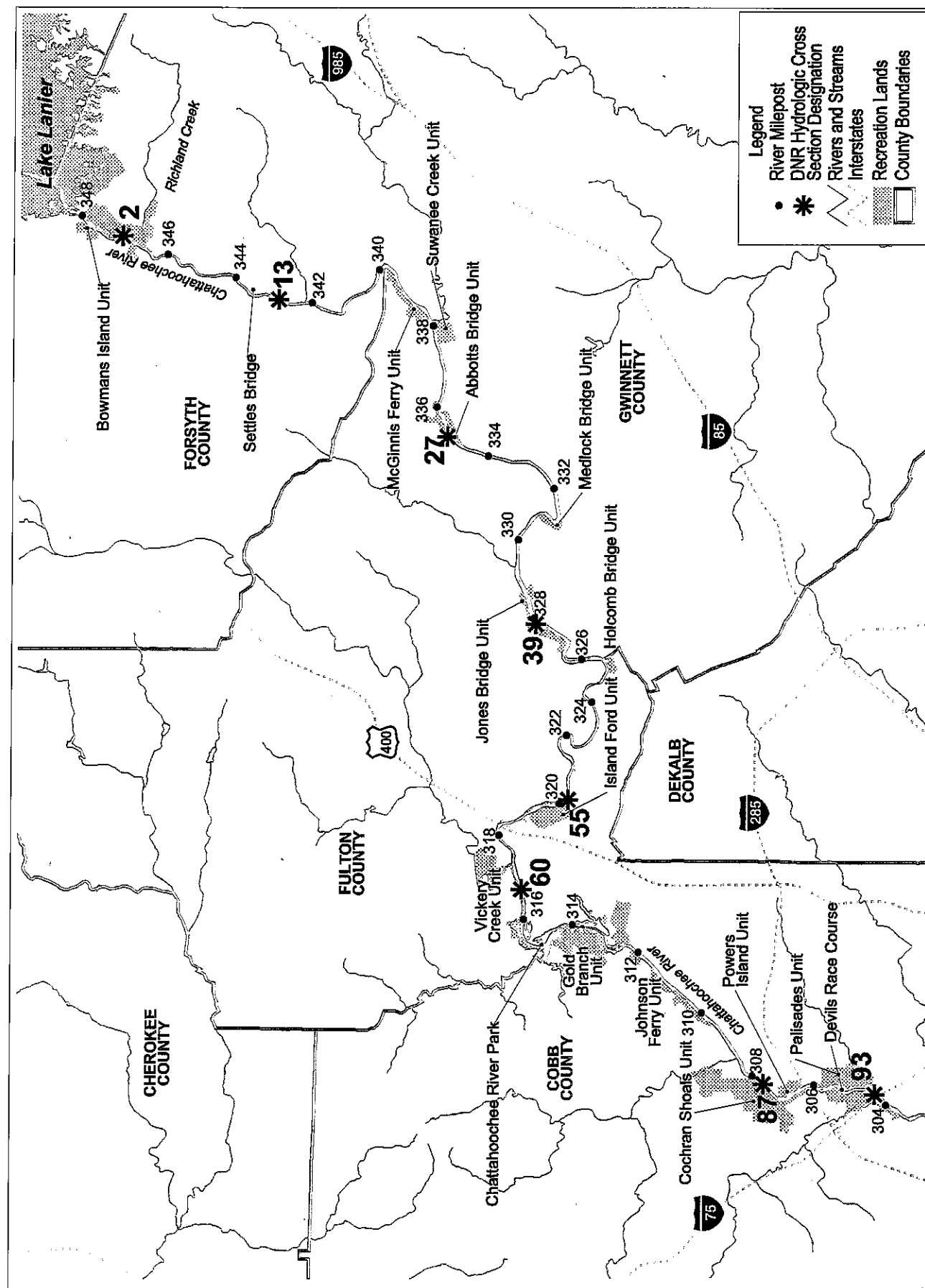
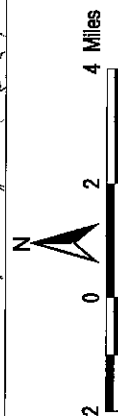


Figure 3-1
Hydrologic Cross Section Locations
CRNRA Recreation Flow Preference Study



1 Chattahoochee River cross section coordinate data were obtained from the Georgia
2 Department of Natural Resources (DNR). Streamflow to velocity relationships were also
3 obtained from the DNR. These data were developed by EPD to support the Chattahoochee
4 River Modeling Project. The model cross section locations are listed in Table 3-2, illustrated
5 in Figure 3-1, and are cross-referenced with the appropriate Recreation Survey Point.

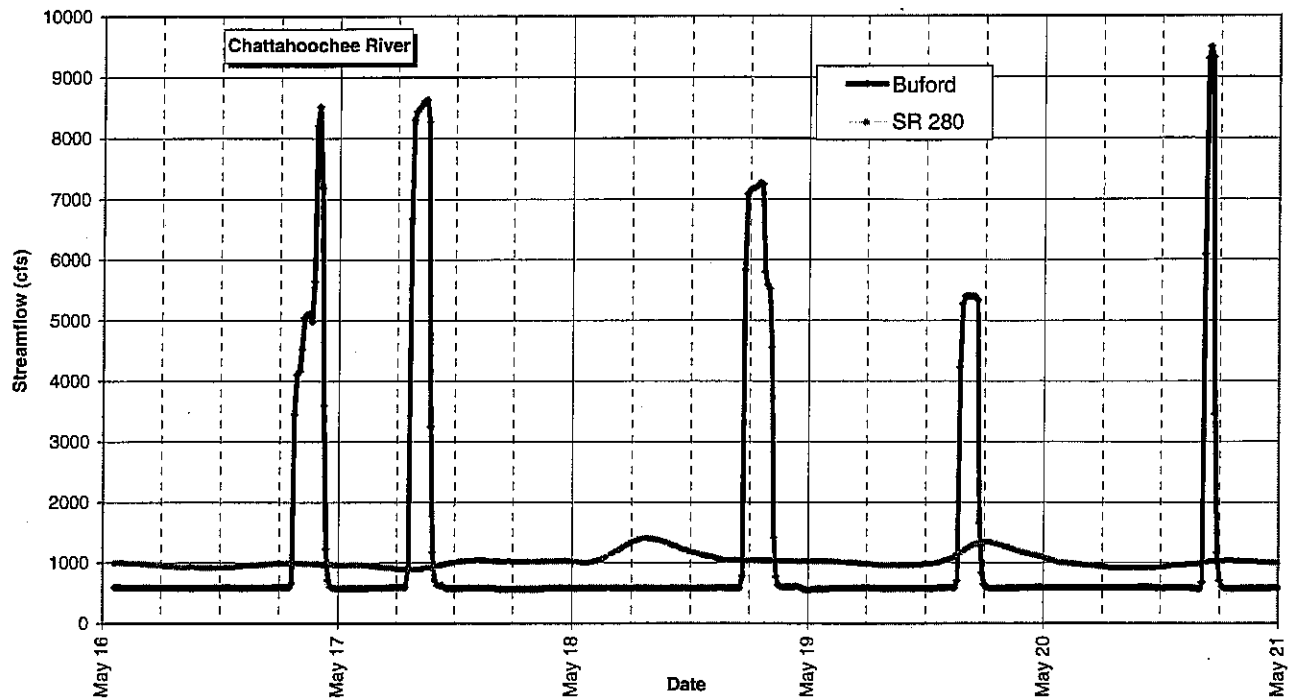
TABLE 3-2
Description of Chattahoochee River Cross Sections

DNR Cross Section	Location	River Mile	Recreation Survey Point	USGS Gauge
2	Haw Creek	347.81	Bowmans Island	Buford
13	Settles Bridge Road	343.49	Settles Bridge	
27	SR 120, Abbots Bridge	335.36	Abbots Bridge Unit	
39	Jones Bridge Shoals	328.04	Jones Bridge Unit	
55	Island Ford Shoals	319.05	Island Ford Unit	
60	Headwaters Bull Sluice Lake	317.20	Chattahoochee River Park	Roswell
87	Mouth of Terrell Branch	306.36	Cochran Shoals / Powers Island Unit	
93	Devils Race Course	304.23	Palisades West / Devils Race Course	

6 Hydrograph Development

7 Streamflow hydrographs at each of the study points were developed from an approximate
8 unsteady flow analysis performed using the unsteady flow model, FEQ (USGS, 1997). The
9 study reach was divided into an upper and a lower reach. The upper reach was defined as
10 the Chattahoochee River between Buford Dam and the headwaters of Bull Sluice Lake. The
11 lower reach was defined as the Chattahoochee River between the Morgan Falls Dam and the
12 Peachtree Creek confluence. Recorded streamflow data from the USGS gauge at Buford
13 Dam were used to define the flow condition at the upstream boundary condition for the
14 upper reach. Recorded streamflow from the USGS gauge at SR 280 was used to define the
15 flow condition at the upstream boundary condition for the lower reach. A lag-time of
16 approximately 6 hours was incorporated to account for travel time between Morgan Falls
17 Dam and the gauge location. Channel geometry was defined using the cross section
18 geometry provided by the DNR. Streamflow hydrographs for the two gauge locations are
19 shown in Figure 3-2. Cross section plots are presented in Appendix A.

1 **FIGURE 3-2**
 2 **Chattahoochee River Hydrographs**

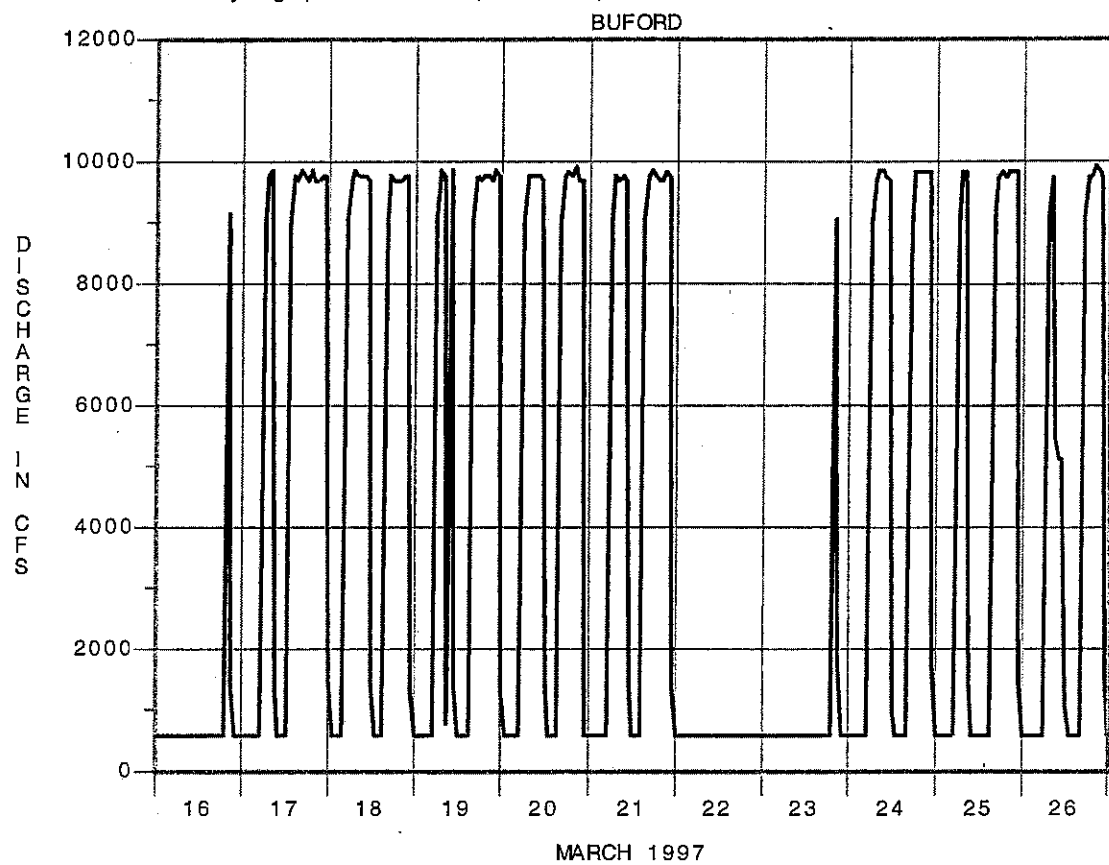


3
 4 Since conditions during the study period reflect drought operating conditions, information
 5 about operating conditions during a normal rainfall year was obtained from the Draft
 6 Environmental Impact Statement for Water Allocation for the ACF River Basin (Corps,
 7 1998). Figures 3-3 and 3-4 illustrate the corresponding hydrographs for Buford Dam during
 8 a typical rainfall year (1997). This information will be used to estimate the amount of time
 9 the preferred recreation flows are available to users during a typical, "wet" year.

10 **Model Calibration and Validation**

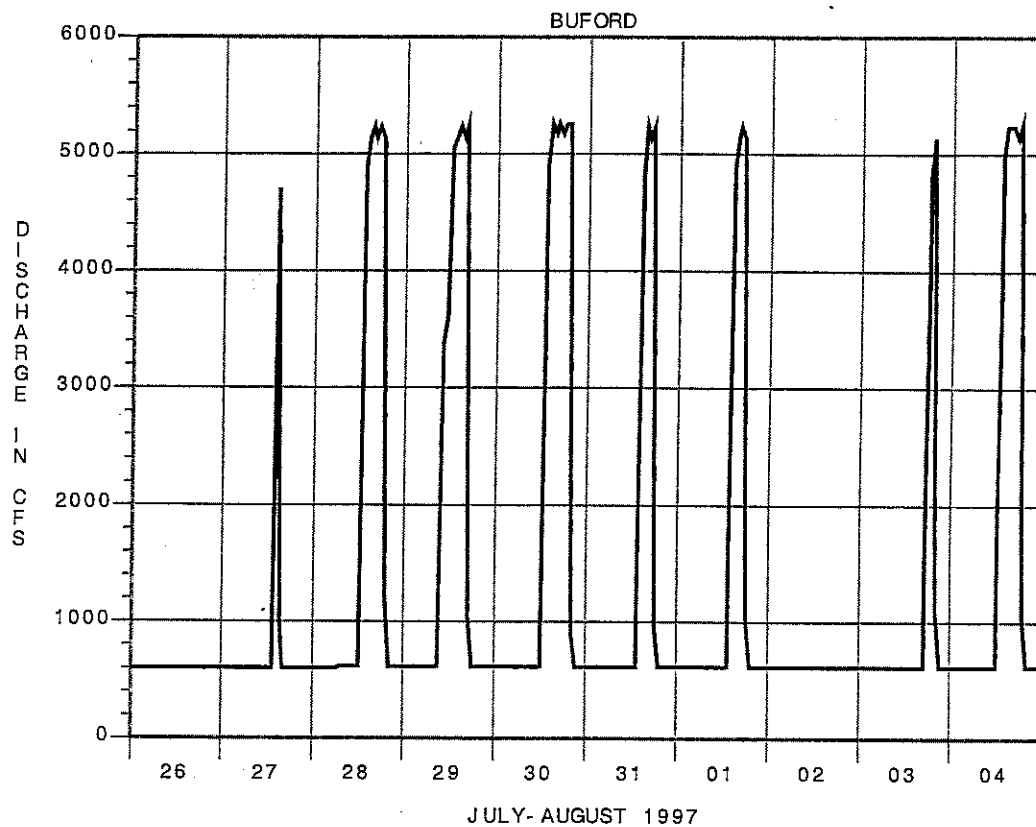
11 The results for the unsteady flow analysis were compared to the recorded USGS streamflow
 12 data to determine the ability of the model to predict streamflow at intermediate cross
 13 section locations. The roughness coefficient was adjusted incrementally in the upper reach
 14 until a reasonable fit was obtained between the recorded and computed data. Additional
 15 timing adjustments were made to the computed hydrographs for the Jones Bridge, Island
 16 Ford Unit and Chattahoochee River Park survey points. Minor timing adjustments were
 17 made to the recorded streamflow data in the lower reach to account for travel time between
 18 Morgan Falls and the SR 280 USGS gauge location. Figures 3-5 and 3-6 show the comparison
 19 between measured and computed streamflow at each of the USGS gauging locations. These
 20 figures show that the model was able to predict peak flows within 10 percent and peak
 21 timing within about an hour. No data are shown for the lower reach because there are no
 22 gauge locations within the reach. The modeling results are assumed to be valid because
 23 streamflow was relatively constant during the study period.

- 1 **FIGURE 3-3**
2 **Chattahoochee River Hydrograph—Buford Dam (March 1997)**



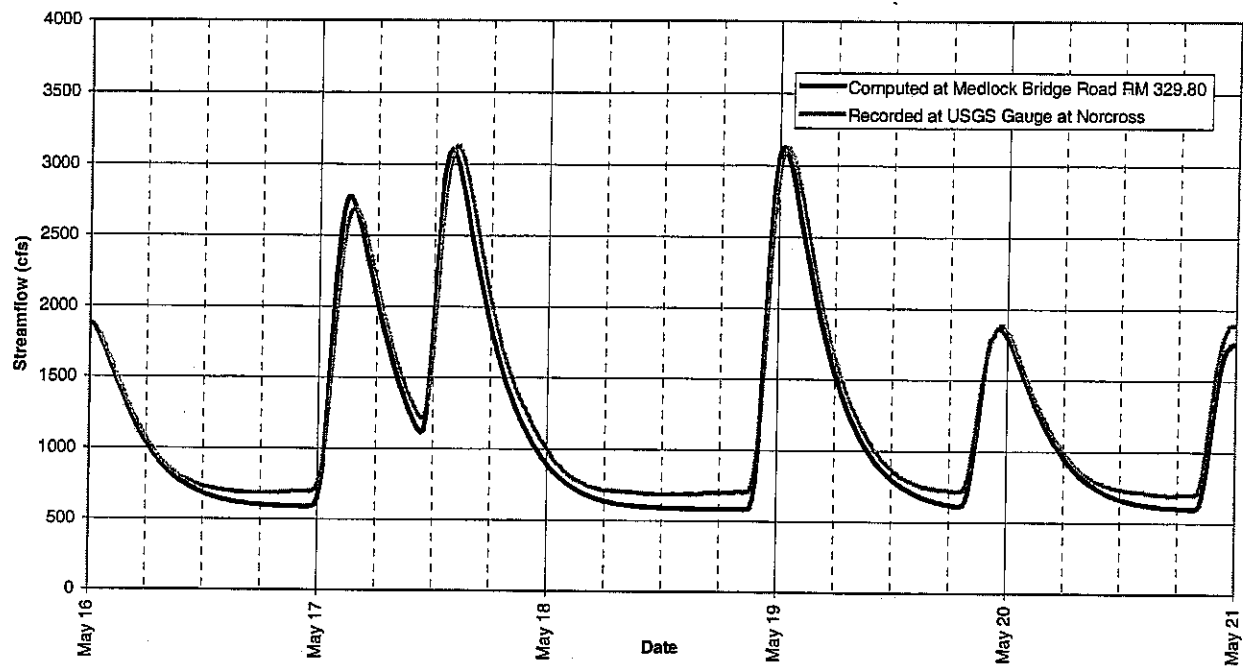
- 3 ——— BUFORD OBSERVED HOURLY DISCHARGE MAR 22 = SATURDAY

1 **FIGURE 3-4**
 2 **Chattahoochee River Hydrograph—Buford Dam (July-August 1997)**

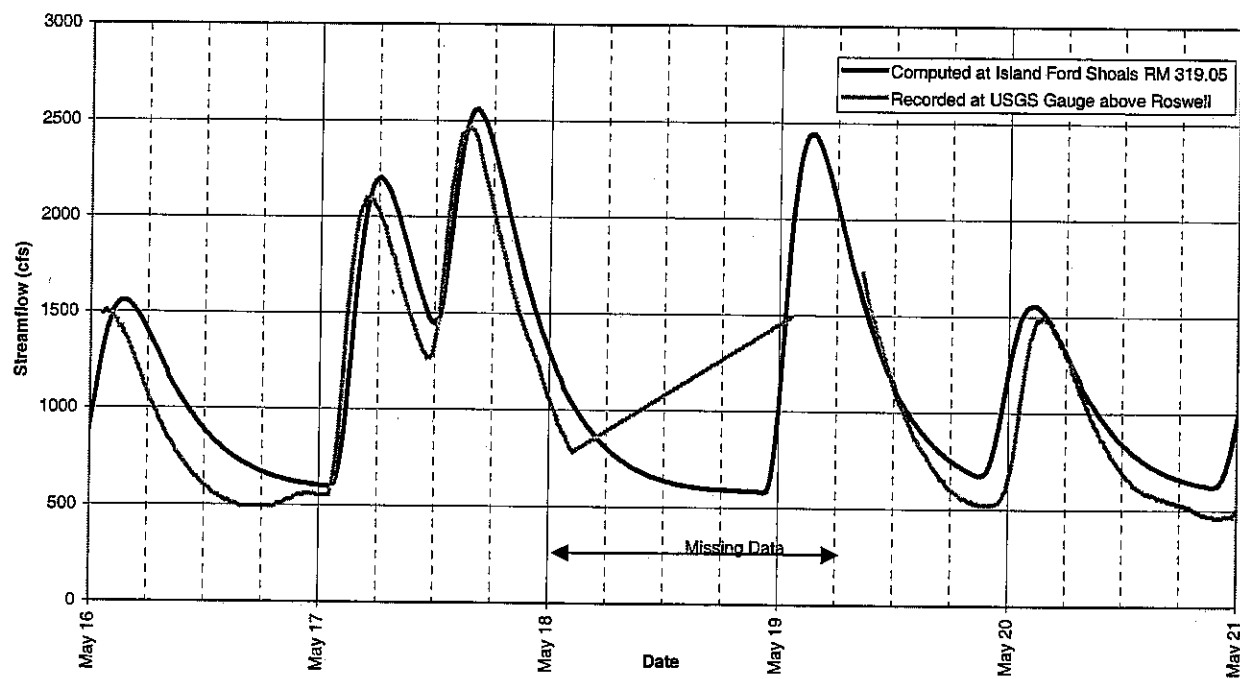


3 ——— BUFORD OBSERVED HOURLY DISCHARGE JUL 26 = SATURDAY
 4

1 **FIGURE 3-5**
 2 Streamflow Comparison at USGS Gauge at Norcross, GA



3
 4 **FIGURE 3-6**
 5 Streamflow Comparison at USGS Gauge above Roswell, GA



Limitations of the Analysis

The intent of this analysis was to approximate flow conditions during the time of the survey. Existing data sources were used to construct the model and no additional survey or field reconnaissance was performed. The model calibration was evaluated in a qualitative manner only. Water withdrawals from and tributary inflow to the Chattahoochee River were not accounted for in the analysis.

Rating Table Development

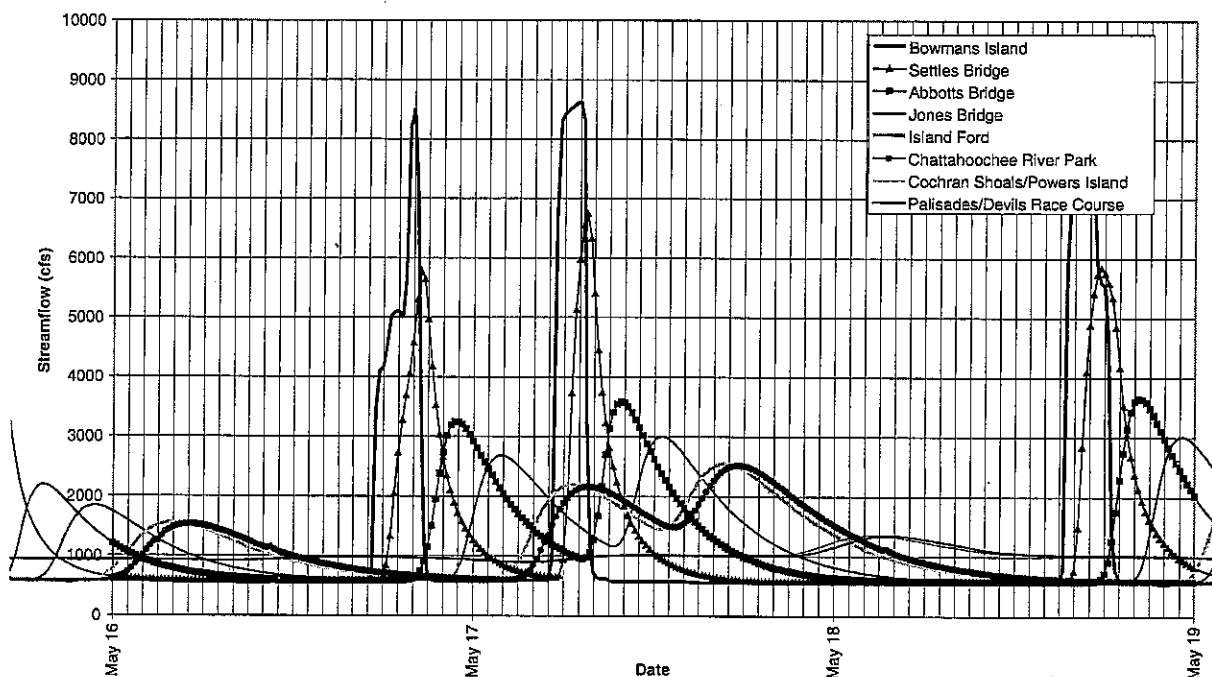
HEC-RAS software created by the Corps' Hydrologic Engineering Center (HEC) (HEC, 1998) and the rating tables provided by the EPD were used to relate streamflow to stage and velocity.

Summary of Analysis

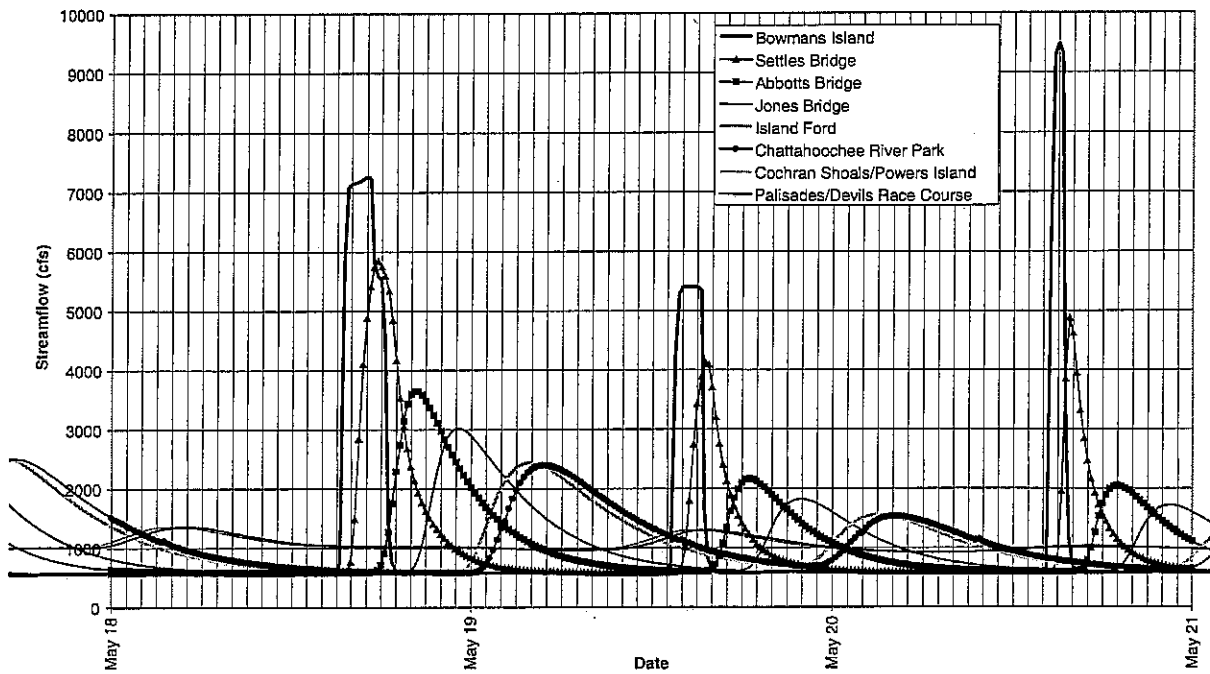
Study Hydrographs

Figures 3-7 and 3-8 show the computed streamflow hydrographs for the May 17th and May 19th recreational surveys. The Bowmans Island hydrograph represents the power generation release from Buford. These figures show that significant attenuation in the lower reach occurs as the power wave moves downstream from the Buford Dam. These figures also show that it takes about a day for the wave to travel from the Buford Dam through the study area.

FIGURE 3-7
Computed Streamflow Hydrograph for May 17th, 2000



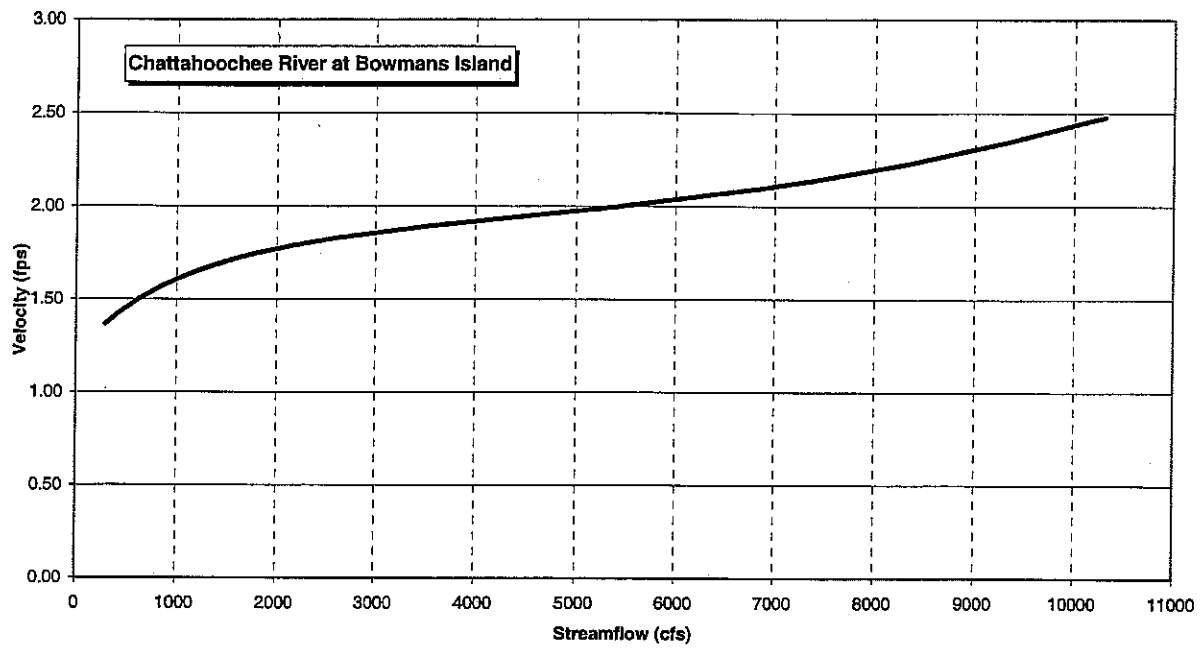
1 **FIGURE 3-8**
 2 **Computed Streamflow Hydrograph for May 19th, 2000**



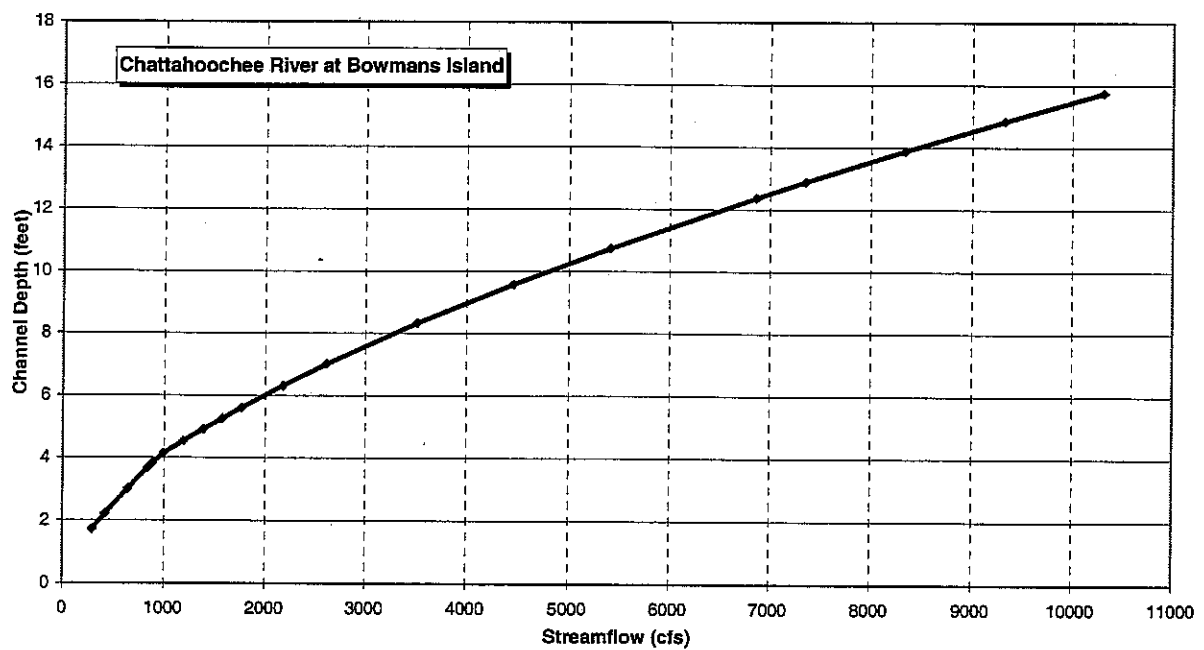
3
 4
 5 **Study Rating Curves**

6 Rating curves relating streamflow to velocity and stage are shown in Figures 3-9 through 3-
 7 16.

- 1 **FIGURE 3-9A**
2 Streamflow – Velocity Relationship at Bowmans Island

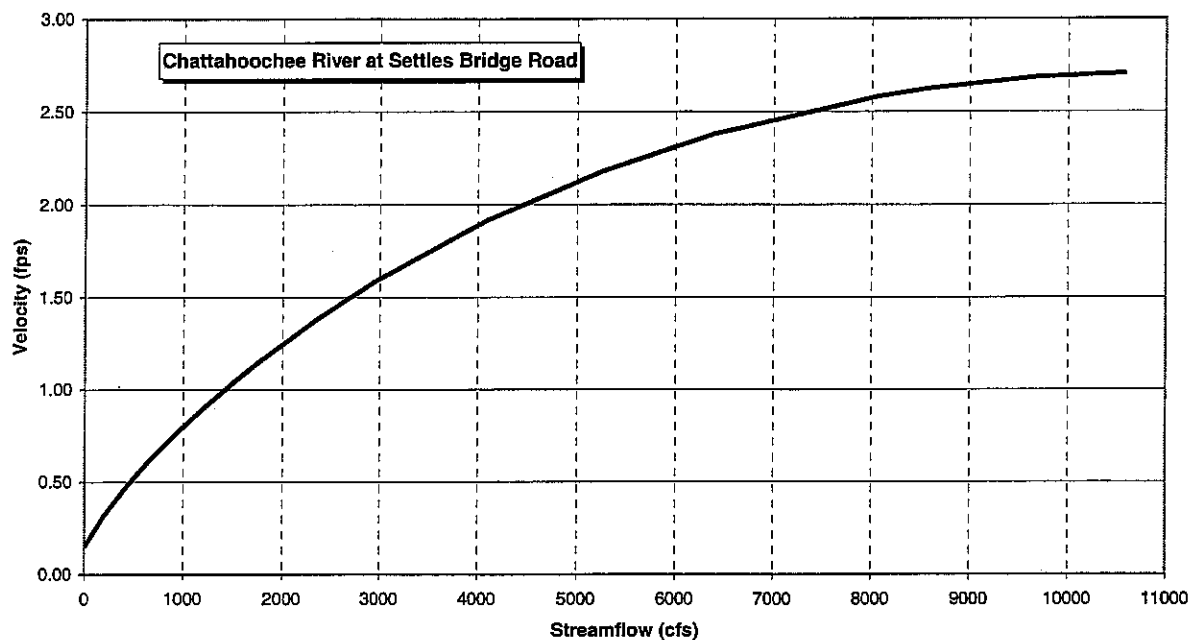


- 3
4 **FIGURE 3-9B**
5 Streamflow – Channel Depth Relationship at Bowmans Island

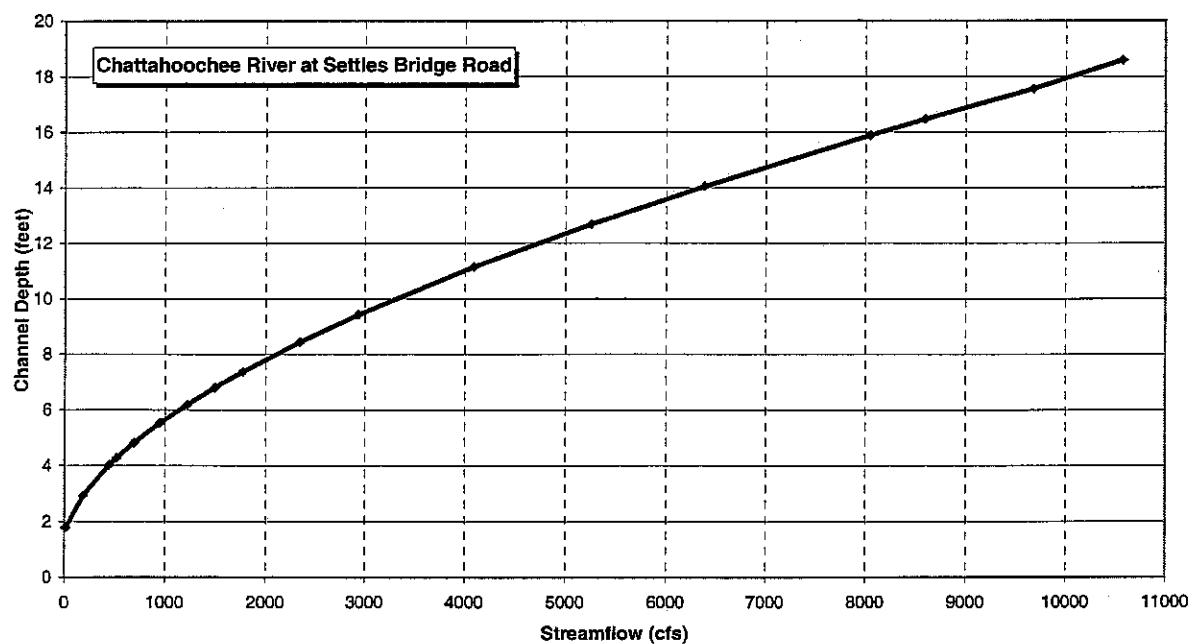


6

1 **FIGURE 3-10A**
2 **Streamflow – Velocity Relationship at Settles Bridge**

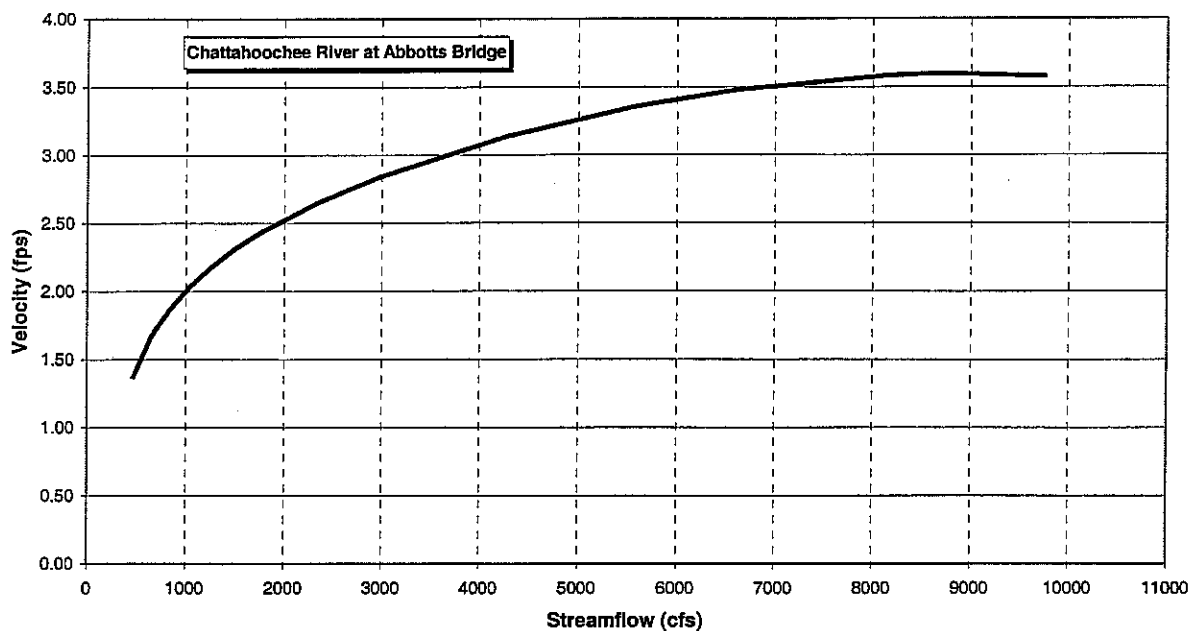


3
4 **FIGURE 3-10B**
5 **Streamflow – Channel Depth Relationship at Settles Bridge**

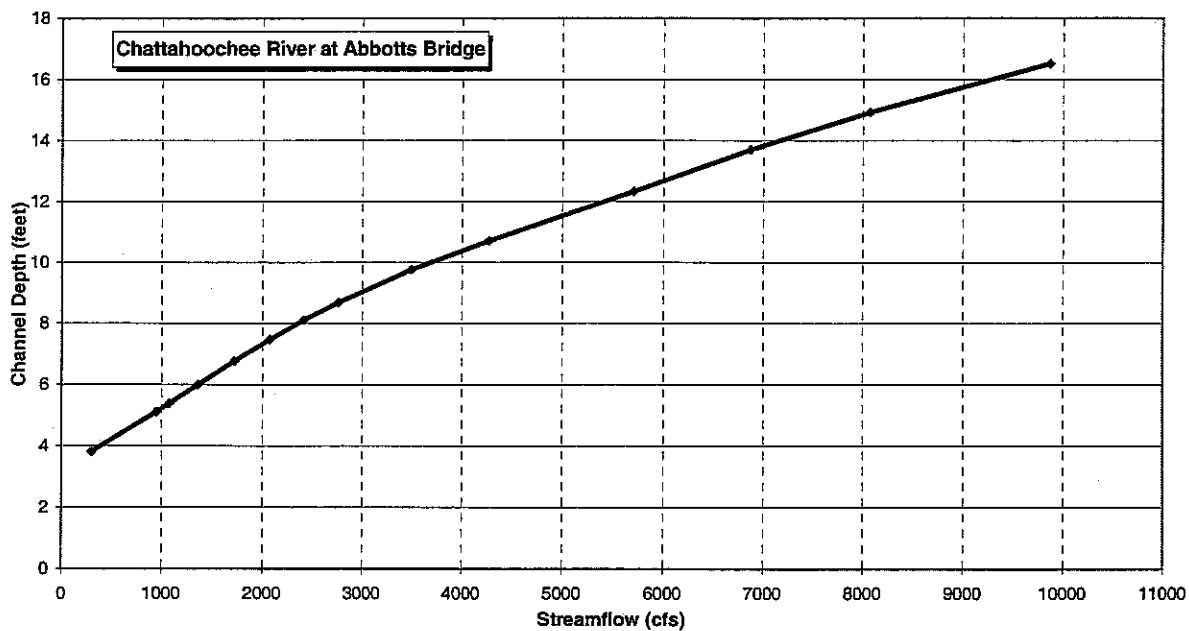


6

1 **FIGURE 3-11A**
2 **Streamflow – Velocity Relationship at Abbotts Bridge Unit**

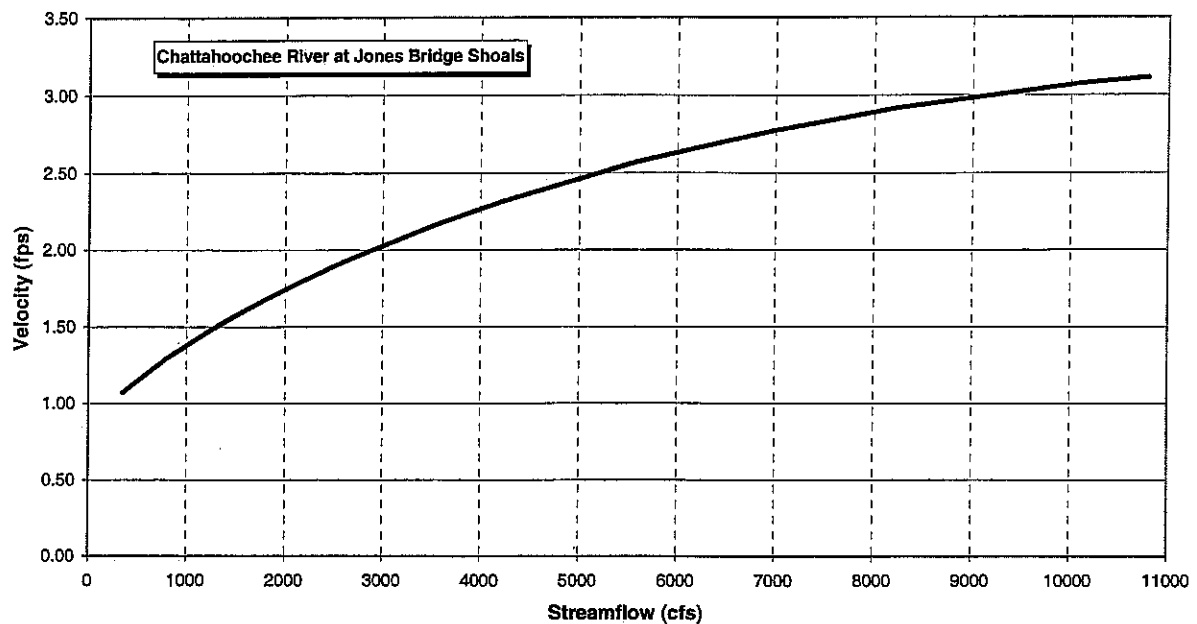


3
4 **FIGURE 3-11B**
5 **Streamflow – Channel Depth Relationship at Abbotts Bridge Unit**

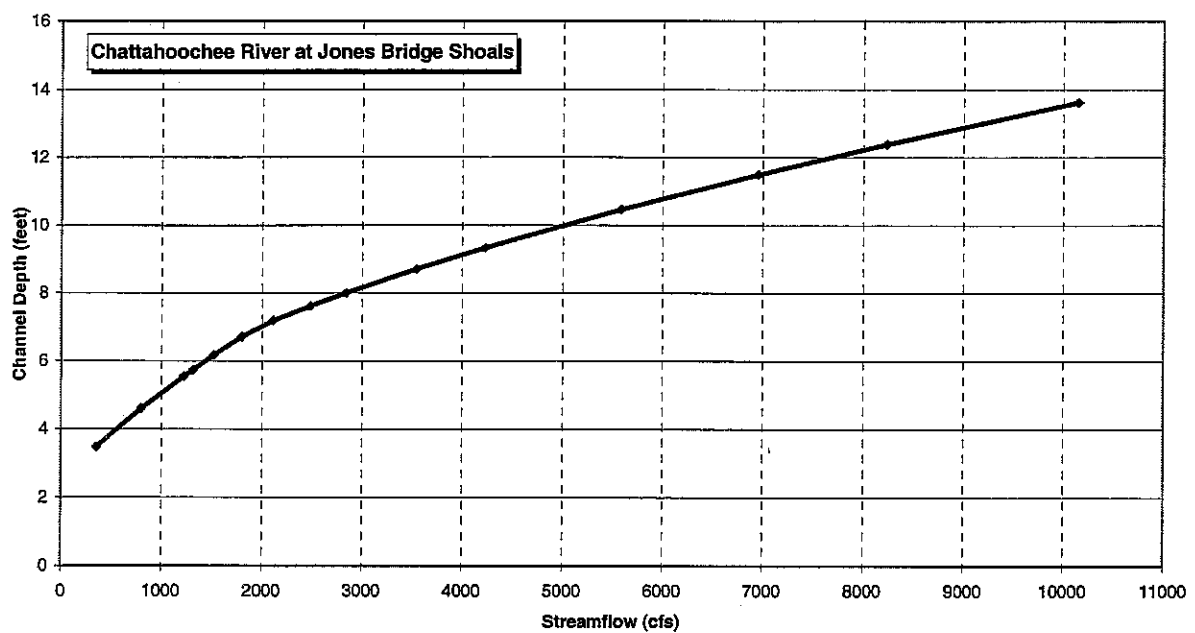


6

- 1 **FIGURE 3-12A**
2 **Streamflow – Velocity Relationship at Jones Bridge Unit**

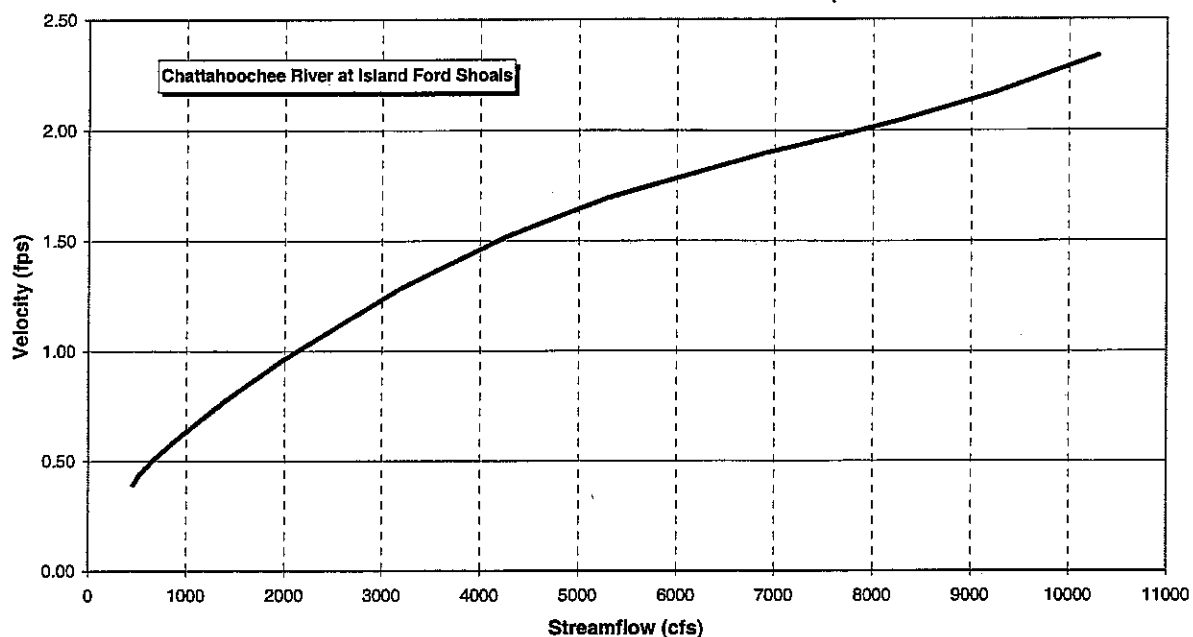


- 3
4 **FIGURE 3-12B**
5 **Streamflow – Channel Depth Relationship at Jones Bridge Unit**

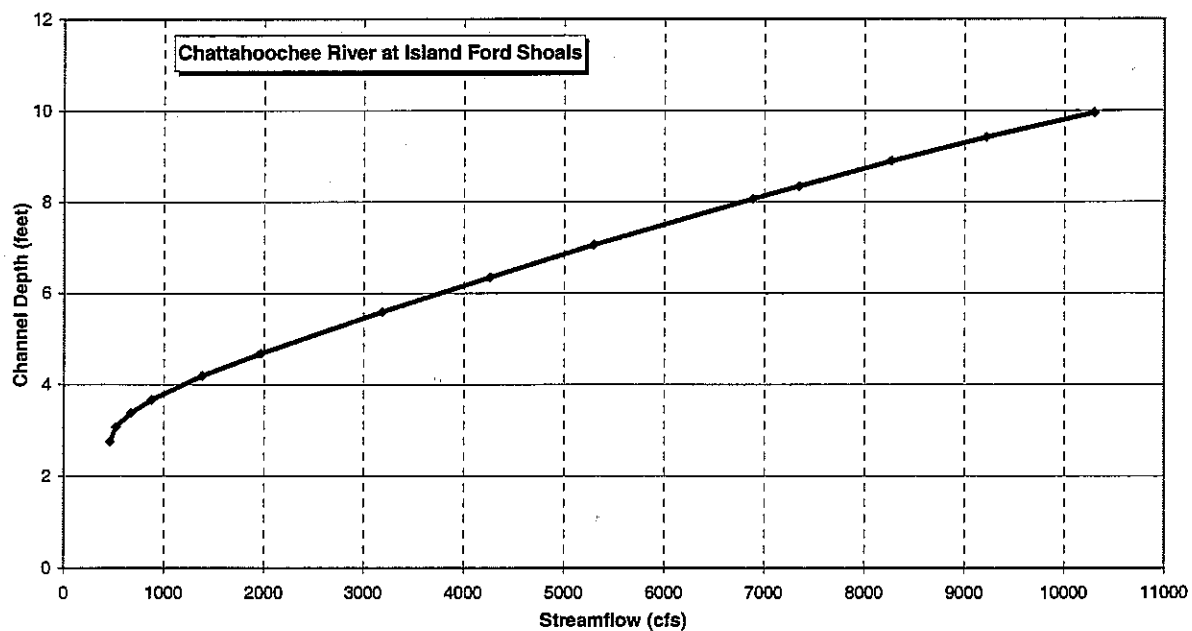


6

- 1 **FIGURE 3-13A**
2 **Streamflow – Velocity Relationship at Island Ford Unit**

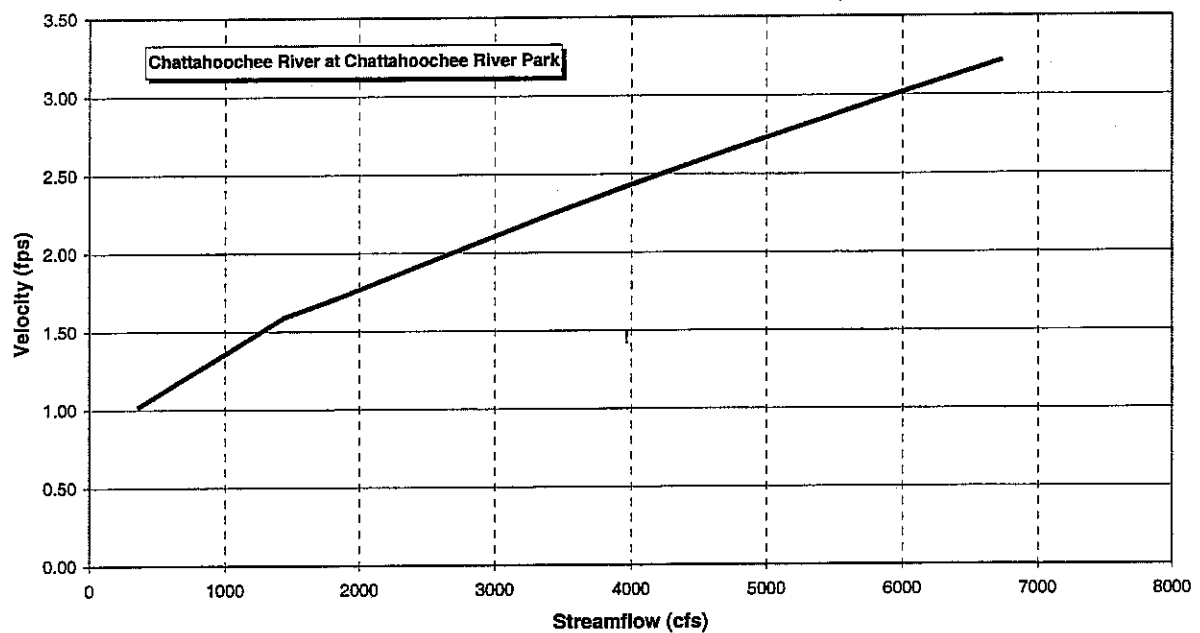


- 3
4 **FIGURE 3-13B**
5 **Streamflow – Channel Depth Relationship at Island Ford Unit**

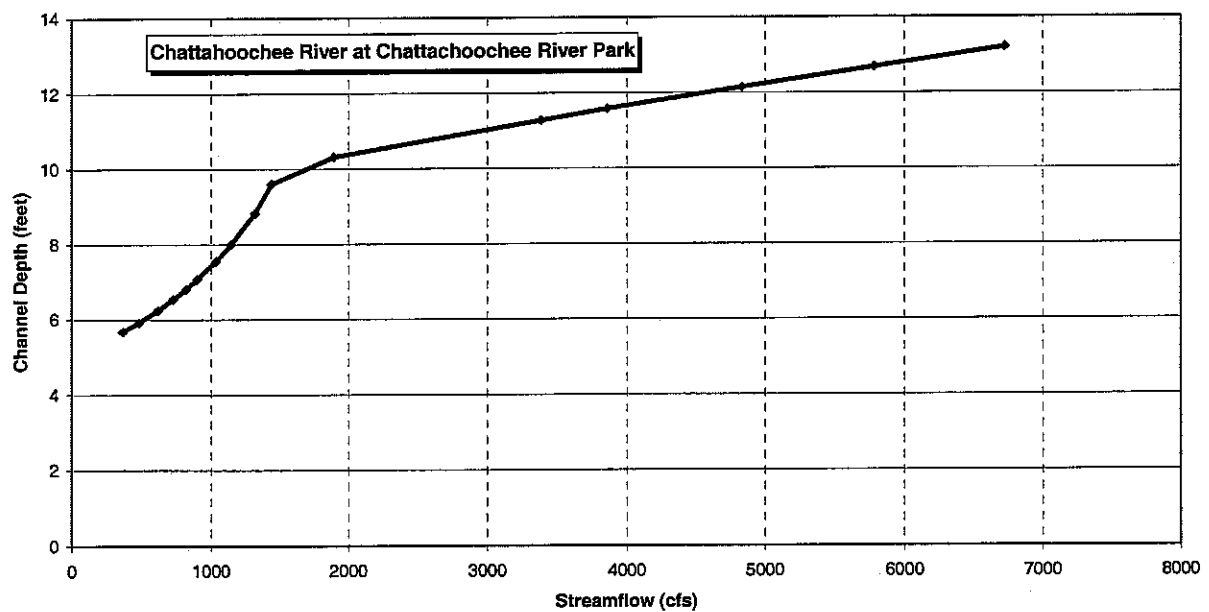


6

- 1 **FIGURE 3-14A**
2 **Streamflow – Velocity Relationship at Chattahoochee River Park**

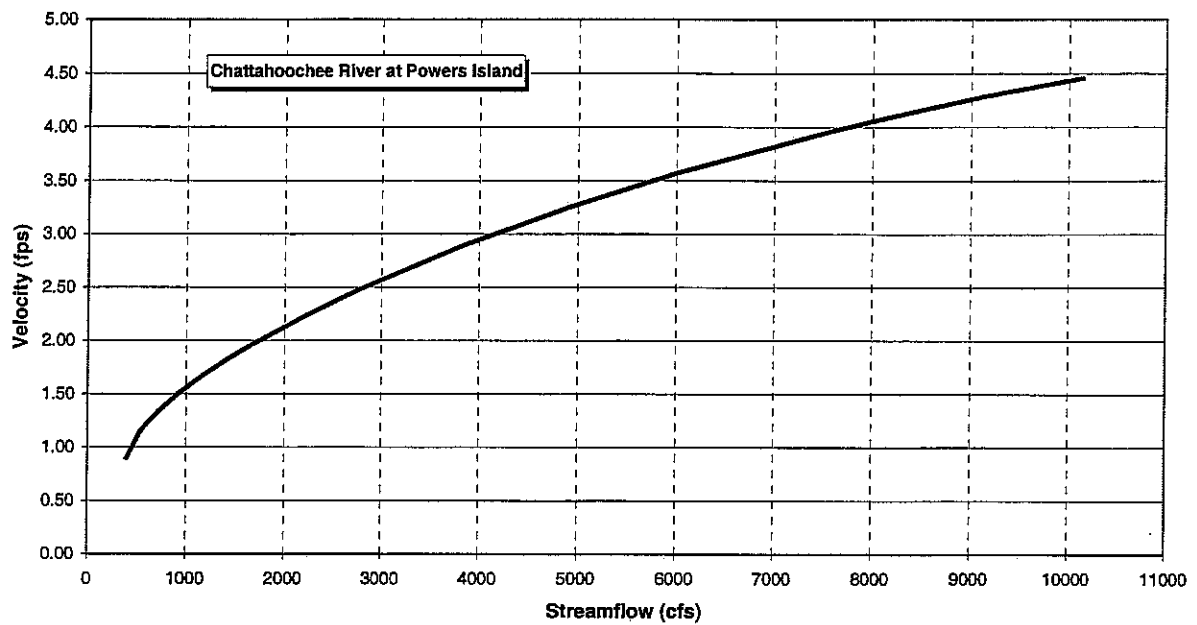


- 3
4 **FIGURE 3-14B**
5 **Streamflow – Channel Depth Relationship at Chattahoochee River Park**

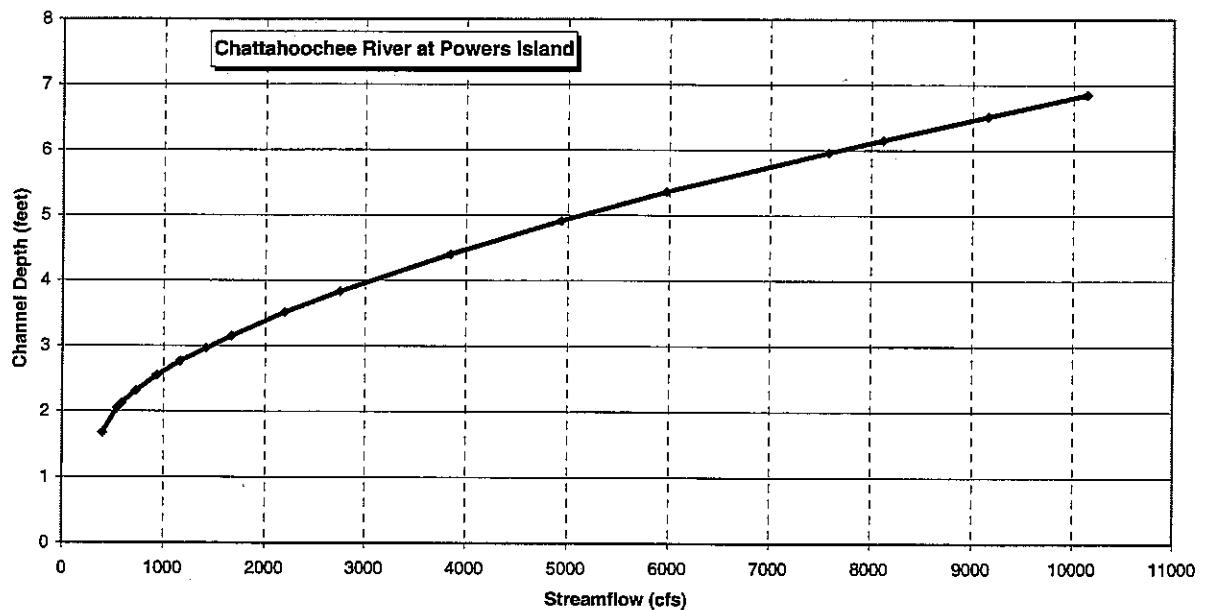


6

- 1 **FIGURE 3-15A**
2 **Streamflow – Velocity Relationship at Powers Island Unit**

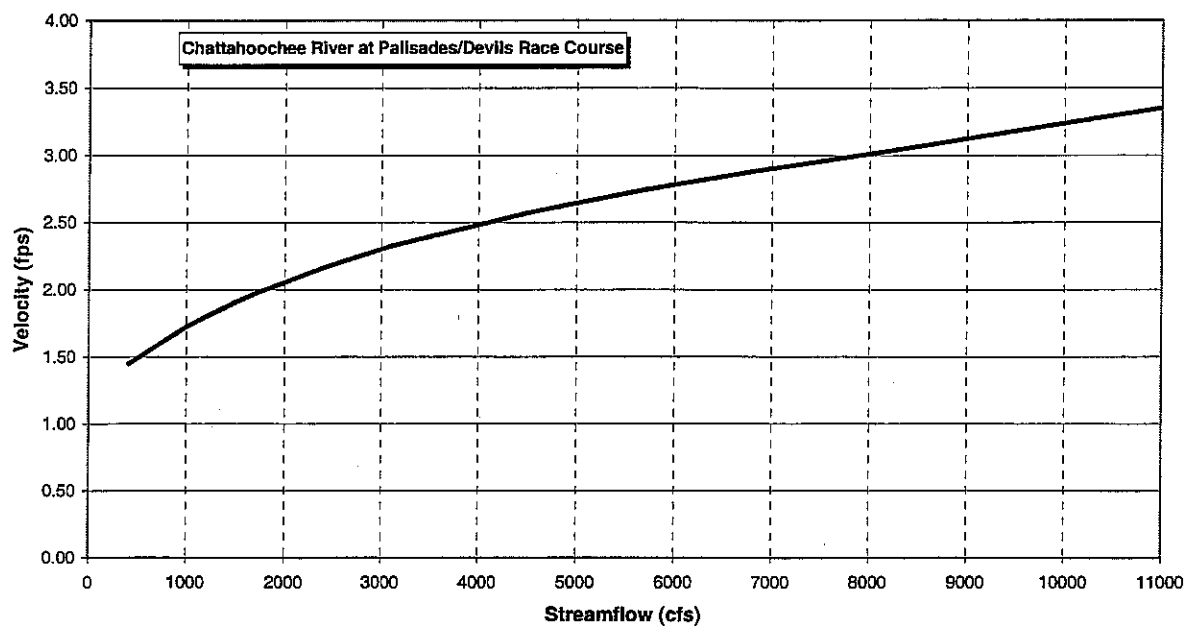


- 3
4 **FIGURE 3-15B**
5 **Streamflow – Channel Depth Relationship at Powers Island Unit**



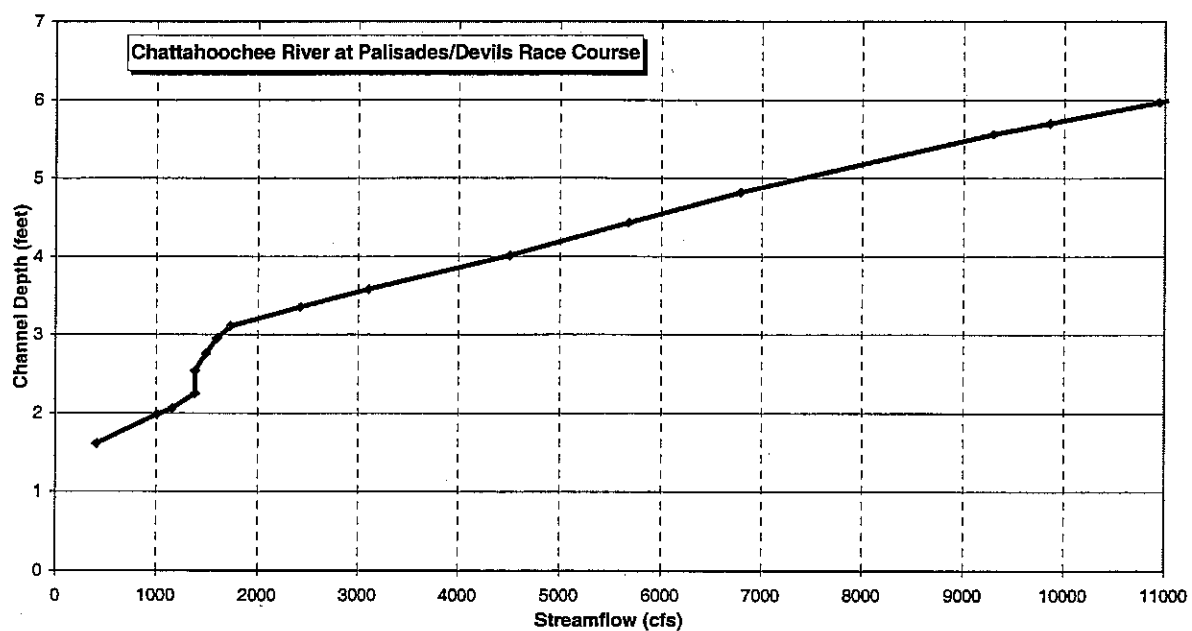
6

1 **FIGURE 3-16A**
2 **Streamflow – Velocity Relationship at Palisades Unit / Devils Race Course**



3

4 **FIGURE 3-16B**
5 **Streamflow – Channel Depth Relationship at Palisades Unit / Devils Race Course**



6

Section 4 – Results

The objectives of this study were to evaluate recreation user preferences for various flow regimes on segments of the Chattahoochee River and estimate the percentage of time when acceptable recreation flow conditions are available under existing flow conditions. Section 2 describes the methodology employed and defines the expert user groups. Section 3 presents the hydrologic data collected from the Corps and EPD on the "time of travel" between Buford Dam and existing USGS monitoring gauges at Norcross and Roswell. Section 3 also provides stage and discharge information for each of the eight video flow observation points and hourly flow data for May 17 through May 19, 2000. This section will utilize the previously discussed information to estimate the amount of time the preferred flows are available for two different flow scenarios. The current drought flow conditions will characterize the lower range of flows, and normal flow conditions (a typical "wet" year) will characterize the upper range of flows. This analysis will eventually be used to compare acceptable recreation flow days per user group when the final allocation formula is proposed.

Current Operating Conditions

The Buford Dam hydroelectric development is owned and operated by the Corps and is part of the Georgia–Alabama–South Carolina grid system of the Southeastern Power Administration (SEPA). As a Department of Energy agency, SEPA is responsible for marketing the electrical power and energy generated at reservoirs operated by the Corps, and to encourage widespread use of this power at the lowest possible cost to consumers. SEPA does not own transmission lines, and must contract with other utilities to provide transmission, or "wheeling" services for the federal power. There are 9 other member facilities in the system, and generation at these facilities is based on the demand for electricity.

Under normal climatic conditions, Buford Dam operates between 2 and 4 hours daily based on demand. The dam began operations in 1957 and has a 105 megawatt plant capacity. Releases from the dam are regulated by the operation of the 3 generating units. A minimum flow unit operates continuously, releasing 600 cfs. The other two units release between 5,000 and 10,000 cfs when in use. In the summer demand tends to increase in the afternoon and evening when residents return from work. In the winter demand typically is split between morning and evening.

Since 1998, the CRNRA project area has experienced drought conditions and is approximately 2 feet below normal on rainfall. Lake Lanier is near elevation 1,064 feet above mean sea level (ft msl), approximately 6.64 feet below the summer elevation of 1,071 ft msl and approximately 5.5 feet below its average elevation for this time of year. As a result, the Corps limits generation to 1 to 2 hours based on demand. The flows typically range between 5,000 and 10,000 cfs with the same seasonal variations in demand.

CRNRA Existing Visitor Surveys

There are a number of existing visitor surveys for the CRNRA. Historically, data collection has focused on the recreation area's land-based activities. A CRNRA Visitor Study conducted from April 11 to April 19, 1998 distributed over 900 surveys within the recreation area and had a 70 percent response rate. Of the respondents surveyed, 6 percent identified fishing and 4 percent identified water sports as their main recreational activities. Three percent of all respondents surveyed (n=639) utilized a boat launch during their visit; 84 percent of those (n=18) commented on the importance of boat launches and rated the launches as either very or extremely important to their recreational activities.

A second CRNRA Visitor Satisfaction and Understanding Survey was conducted from August 19 to September 15, 1998. The survey results identified the following visitor comments related to river recreation:

- Install additional river access points.
- Install additional docks for anglers with children.
- Provide signage indicating the safety of the river for swimming.
- Provide additional boat trailer parking at Medlock Bridge boat ramp.

In addition, multiple comments concerning water quality would indicate that these conditions affected the visitor's recreational experience. Comments included reference to trash, murky water and odors. While these two surveys provided valuable information to NPS, the emphasis was on land-based recreation activities and not water-based recreation activities. Therefore, it is not possible to use these data for comparison.

Efforts to quantify the amount of river recreation usage along the CRNRA via other data sources such as creel surveys and commercial operations revealed that there is a lack of readily available information on this topic. To assess the potential impacts of future flow regimes on CRNRA recreation users, it will be important for future survey efforts to capture the amount of usage the CRNRA receives.

Expert User Discussions

Discussions were held with each of the expert user groups to solicit feedback concerning their specific recreation flow preference. Summary tables documenting each group's feedback from the flow video are provided in Appendix B. Group 1 included three powerboat-fishing participants who preferred either a moderately high and swift flow or a low and swift flow. These boat users indicated that more water allows better river access for motorized boats; however, they also indicated that fishing is better during lower flows. Based on their comments and video feedback, a recreation flow preference of 1,000 cfs to 1,200 cfs was assumed for this group.

Group 2 represented the float and wade fishing expert users. The group was split in preferring a low and swift flow or a moderately high and slow flow. Their primary flow concerns centered on maintaining a healthy habitat for fish. They identified water temperature, dissolved oxygen, food, length of release and volume of release as the major factors affecting the quality of the fishing along CRNRA. These factors are important for

1 both the bugs that sustain the fish as well as the health of the fish themselves. For example,
2 a high volume, short duration release was considered beneficial since it scoured the riverbed
3 of its accumulated sediments, therefore creating a better habitat for fish.

4 Group 2 participants were also aware of the temperature stratification of Lake Lanier and its
5 relationship to releases from Buford Dam. The Lake's water temperature is stratified from
6 spring until early winter, with the deepest portions of the Lake being colder than the surface
7 waters. This becomes an issue for fisherman when all three generating units are in use
8 because the water is pulled from the bottom and top of the Lake, therefore increasing
9 downstream temperatures. In the winter it is especially important because the high
10 turbidity of releases negatively affects the quality of fishing.

11 Once on the river, the fishermen tend to gauge levels by natural features such as exposed
12 rocks and branches. In general, those persons engaging in float or wade fishing preferred
13 low flows, commenting that ideal flows are between 1,000 and 1,200 cfs. This was their
14 perceived flow rate based on their fishing experiences. Based on their comments and video
15 feedback, a recreation flow preference of 1,000 cfs to 1,200 cfs was assumed for this group.

16 Group 3 represented those recreation users with non-motorized boats. This includes shell
17 rowers, rafters, kayakers and canoeists. The rowers in attendance commented primarily on
18 conditions at the Chattahoochee River Park since Bull Sluice Lake / Morgan Falls is the only
19 suitable location along the CRNRA for shell rowing. The rowers indicated that they were
20 able to row year-round and have one major racing event each year on the CRNRA. Juniors
21 typically row during the week and the masters on the weekend. Two of the rowers
22 surveyed preferred high and slow flows, while one rower preferred "moderately" high and
23 slow flows. They all agreed that shell rowers prefer a minimum of 12 inches and a
24 maximum of 18 inches of water for rowing. Based on these comments, a depth to flow
25 comparison allowed for data conversion to cfs. The depths were translated into
26 approximately 1,000 cfs to 1,200 cfs.

27 Non-motorized boat (rafts, kayaks, and canoes) users indicated that they typically did not
28 call for release information because this did not impact their use of the river. Different
29 recreation flows were expected to create different river experiences, and some users based
30 their decision to utilize the river on other factors such as a full moon. For example, the full
31 moon was considered desirable by rafters wanting a twilight rafting experience. Non-
32 motorized boat users said that the river can be difficult to navigate at low flows, and as a
33 results many of the hydraulics / play spots disappear. While this might be seen as less
34 challenging for beginners, low flows require all boaters to exit their boats to portage around
35 low spots.

36 Of the eight kayakers present, three preferred a low and swift flow, two preferred a
37 moderately high and slow flow, one participant wanted high and swift flows, and two
38 expert users did not identify a preferred flow level. These expert users indicated that the
39 Powers Ferry to Highway 41 section of the River was the best section for kayakers and
40 canoeists. They also indicated that the Devils Race Course, which has play spots at higher
41 flows, is the most popular location on the river for this group. In general, these users prefer
42 a medium to high flow of approximately 6,000 cfs since it created play spots and provided a
43 good workout opportunity.

Recreation Flow Analysis

The expert user flow preferences and hydrologic data were correlated to estimate the amount of time that recreational flow preferences are met by release conditions during a drought year and a typical "wet" year. Drought conditions represented by the study period (May 2000) are indicative of the lower range of flows. Typical wet conditions define the upper range of flows and represent historical normal flow conditions for the river.

Time of day is an important factor in assessing the availability of the preferred recreation flows. For the purposes of this study, typical recreation use is characterized as either summer or off-season based on the amount of seasonal daylight available. Table 4-1 presents recreation use times and the number of recreation hours available by season. The assumption was made that the majority of recreation users are employed, so their primary recreation activities occur after work and on the weekends. Based on this assumption, during the summer season there are approximately 49 recreation hours per week and 21 hours during the off-season.

TABLE 4-1
Recreation Use Times

Season	Time Available	Number of Hours/ Day	Number of Hours / Week
Summer (June to September)			
	Weekdays (5) 4 p.m. to 9 p.m.	5	25
	Weekend days (2) 9 a.m. to 9 p.m.	12	24
Total recreation hours per week:			49
Off-Season (October to May)			
	Weekdays (5) 4 p.m. to 5 p.m.	1	5
	Weekend days (2) 9 a.m. to 5 p.m.	8	16
Total recreation hours per week:			21

The week of May 16 through May 22, 2000, which includes the video shoot dates, was used to analyze a low flow scenario. The week of July 28 to August 3, 1997 represents a "wet" year which portrays normal flow conditions for the river.

Table 4-2 presents the time and duration of the preferred recreation flows during representative summer weeks in 1997 and 2000. The preferred flow for wade / float fishing, shell rowing, and power boating is 1,000 to 1,200 cfs. The preferred recreation flow for kayaks, canoes and rafts is between 5,000 and 6,000 cfs. The time depicted in the table represents the time of day these preferred flows were available. It also provides the duration, or the amount of time the preferred flows are available. Both the time and duration of flows are set by SEPA based on the demand for power. Under "normal," wet conditions, the Corps operates between 2 and 4 hours a day. Under drought conditions, operations are limited to 1 or 2 hours a day. The numbers in bold in Table 4-2 correspond to flows within the assumed recreation use times outlined in Table 4-1.

TABLE 4-2
Amount of Time at Preferred Recreation Flows, 1997 and 2000¹

Parameter & Year	Tuesday 7/28/97	Wednesday 7/29/97	Thursday 7/30/97	Friday 7/31/97	Saturday 8/1/97	Sunday 8/2/97y	Monday 8/3/97y	Total Mins @ Rec Flows
Wade / Float Fishing, Rowing, and Power Boating (Preferred Flow = 1,000 to 1,200 cfs)								
Time - 1997	12 p.m. and 7:20 p.m.	9:30 a.m. and 5:30 p.m.	12 p.m. and 8:30 p.m.	2 p.m. and 7 p.m.	2 p.m. and 7 p.m.	No Generation ²	5:30 p.m. and 8:30 p.m.	
Duration - 1997	5-10 mins	5-10 mins	5-10 mins	5-10 mins	5-10 mins	0	5-10 mins	35 mins
Time - 2000	5:30 p.m. and 8:45 p.m.	5:15 a.m. and 8:00 a.m.	3:30 p.m. and 6:45 p.m.	1:30 p.m. and 3:45 p.m.	2:30 p.m. and 4:00 p.m.	3:30 p.m. and 5:45 p.m.	1:30 p.m. and 4:45 p.m.	
Duration - 2000	5-10 mins	5-10 mins	5-10 mins	5-10 mins	5-10 mins	5-10 mins	5-10 mins	35 mins
Kayaks, Canoes and Rafts (Preferred Flow = 6,000 cfs)								
Time - 1997	2 p.m. to 7 p.m.	11 a.m. to 4 p.m.	2:30 p.m. to 7:30 p.m.	3:30 p.m. to 6 p.m.	3:30 p.m. to 6 p.m.	No Generation ²	7 p.m. to 8 p.m.	
Duration - 1997	300 mins	300 mins	300 mins	150 mins	150 mins	0	60 mins	21 hours
Time - 2000	7:30 p.m. and 8:30 p.m.	5:40 a.m. and 7:20 a.m.	3:45 p.m. and 5:30 p.m.	1:45 p.m. to 3:15 p.m. ³	2:45 p.m. and 3:30 p.m.	3:45 p.m. and 5:30 p.m.	1:45 p.m. to 4:15 p.m. ³	
Duration - 2000	5-10 mins	5-10 mins	5-10 mins	90 mins	5-10 mins	5-10 mins	150 mins	5 hours

Notes:

Times in **bold** correspond to flows falling within the assumed recreation use time.

¹ The two dates in each column heading correspond to the time and duration information in the table body: 1997 data above the dotted line, and 2000 data below the dotted line.

² The Corps did not generate on Sunday, August 2, 1997.

³ Release did not reach 6000 cfs, this number represents the amount of time above 5000 cfs.

1 Table 4-3 illustrates the percentage of time acceptable flows are available during a
 2 representative summer week in 1997 and 2000. For both of these time periods, acceptable
 3 flows for wade / float fishing, rowing, and power boating were available for less than 1
 4 percent of the total available daylight hours. Acceptable flows for kayaks, canoes, and rafts
 5 were available for 21 percent of the total daylight hours in 1997, representing conditions
 6 during a normal, "wet" year. In contrast, this percentage drops to 5 percent during the
 7 drought, or low flow, conditions represented during 2000.

TABLE 4-3
 Percentage of Time Acceptable Flows Are Available

	1997 Hours	% of Acceptable Hours	2000 Hours	% of Acceptable Hours
<i>Wade / Float Fishing, Rowing, and Power Boating</i>				
Total Available	98	< 1%	98	< 1%
Total Acceptable	0.5		0.5	
<i>Kayaks, Canoes and Rafts</i>				
Total Available	98	21%	98	5%
Total Acceptable	21		5	

9 Conclusion

10 Under current operating conditions for Buford Dam during drought and "wet" years, the
 11 preferred recreation flows for wade / float fishing, rowing and power boating within the
 12 CRNRA are not being met. After analysis of both flow conditions, it was determined that an
 13 approximate flow of 1,000 to 1,200 cfs is available less than 1 percent of the time. The
 14 preferred recreation flow for kayaks, canoes and rafts of 6,000 cfs was available 21 percent of
 15 the time during "wet" years, compared to 5 percent of the time during drought conditions.
 16 No standards currently exist that quantify what an acceptable percentage of available flows
 17 should be for these water-based recreation activities. However, it seems reasonable to
 18 assume that the recreation needs of CRNRA users are not being met under these flow
 19 conditions. The preferred flows are occurring either at night or during low use times when
 20 the majority of recreation users are at work. In summary, the NPS will need to analyze the
 21 amount of time and duration of flows to evaluate options for achieving the preferred flows
 22 once a decision is made on the proposed allocation formula for the Chattahoochee River.

Section 5 – Bibliography

- 2 Allen, D.S., R.S. Jackson, and A.L. Perr. 1996. Alabama-Coosa-Tallapoosa and Apalachicola-
3 Chattahoochee-Flint Comprehensive Study, Recreation Demand Element, Final Draft
4 Report, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 1996.
- 5 Brown, Fred and Sherri M.L. Smith. 1998. The Riverkeeper's Guide to the Chattahoochee
6 River. CI Publishing, Atlanta.
- 7 Franz, Delbert and Melching, Charles, Full Equations (FEQ) Model for the Solution of Full,
8 Dynamic Equations of Motion for One-Dimensional Unsteady Flow in Open
9 channels and through Control Structures, US Geological Survey Water Resources
10 Investigations Report 96-4240, 1997.
- 11 Georgia Environmental Protection Division, Chattahoochee River Modeling Project. Cross
12 section data and flow rating curves.
- 13 Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers. HEC-RAS River
14 Analysis System, v. 2.2, September 1998.
- 15 (<http://sepa.fed.us/general.htm>) by H. Dyke, 7/12/2000.
- 16 University of Idaho Cooperative Park Studies Unit for the National Park Service,
17 Department of the Interior. Chattahoochee River NRA 1998 Visitor Survey Card
18 Data Report.
- 19 U.S. Army Corps of Engineers, Mobile District. Water Allocation for the Apalachicola-
20 Chattahoochee-Flint (ACF) River Basin, Draft Environmental Impact Statement,
21 September 1998.
- 22

Appendix A – River Transect Graphs

FIGURE A-1
River Transect at Bowmans Island

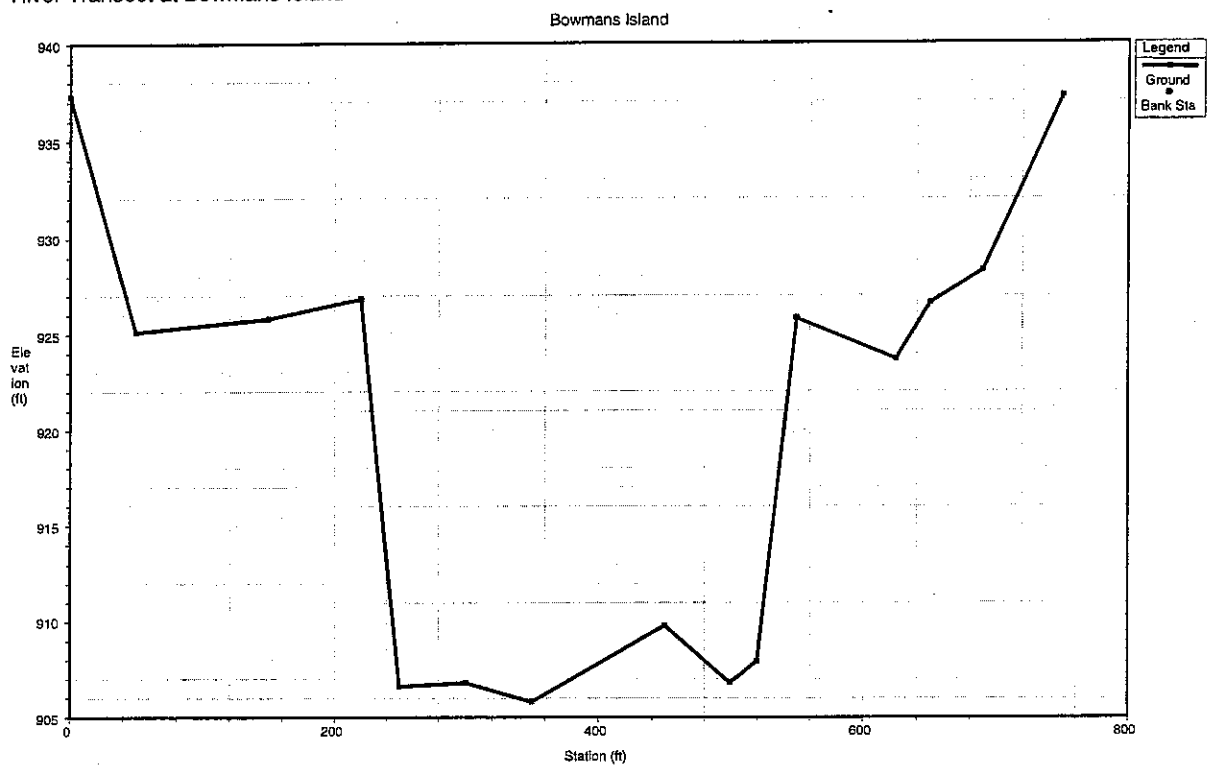


FIGURE A-2
River Transect at Settles Bridge

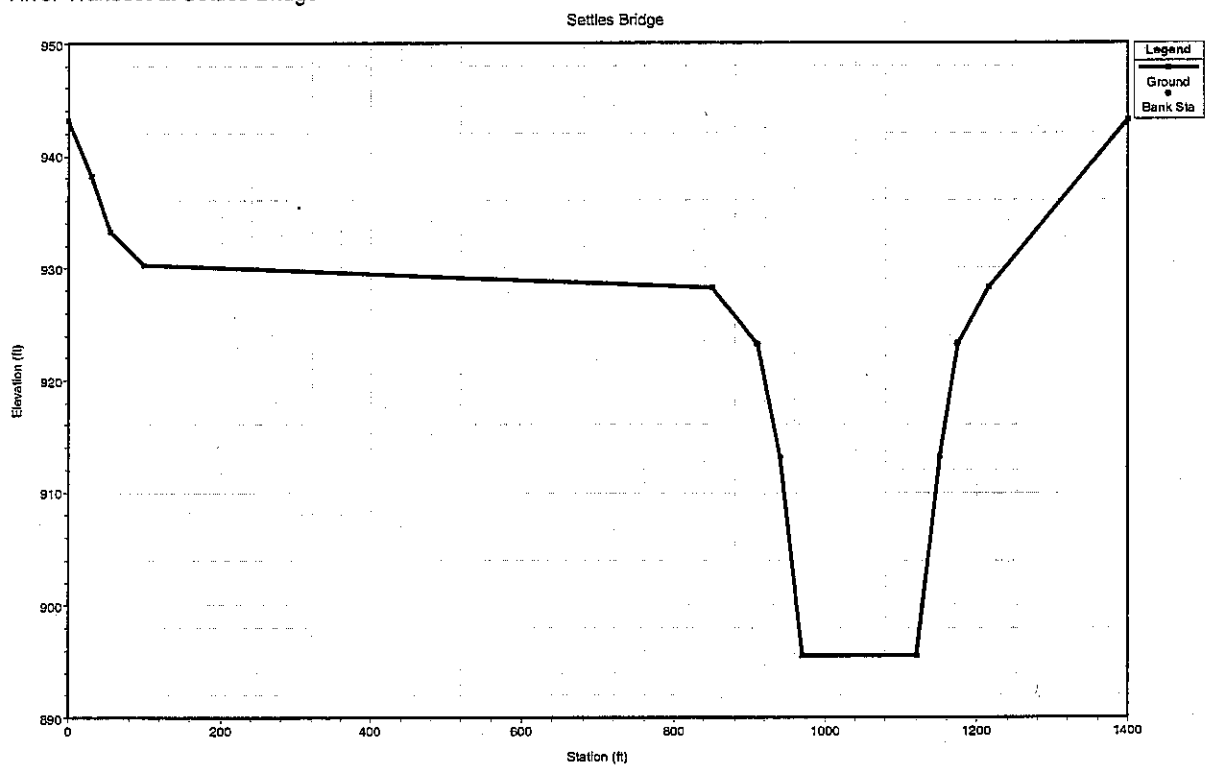


FIGURE A-3
River Transect at Abbotts Bridge Unit

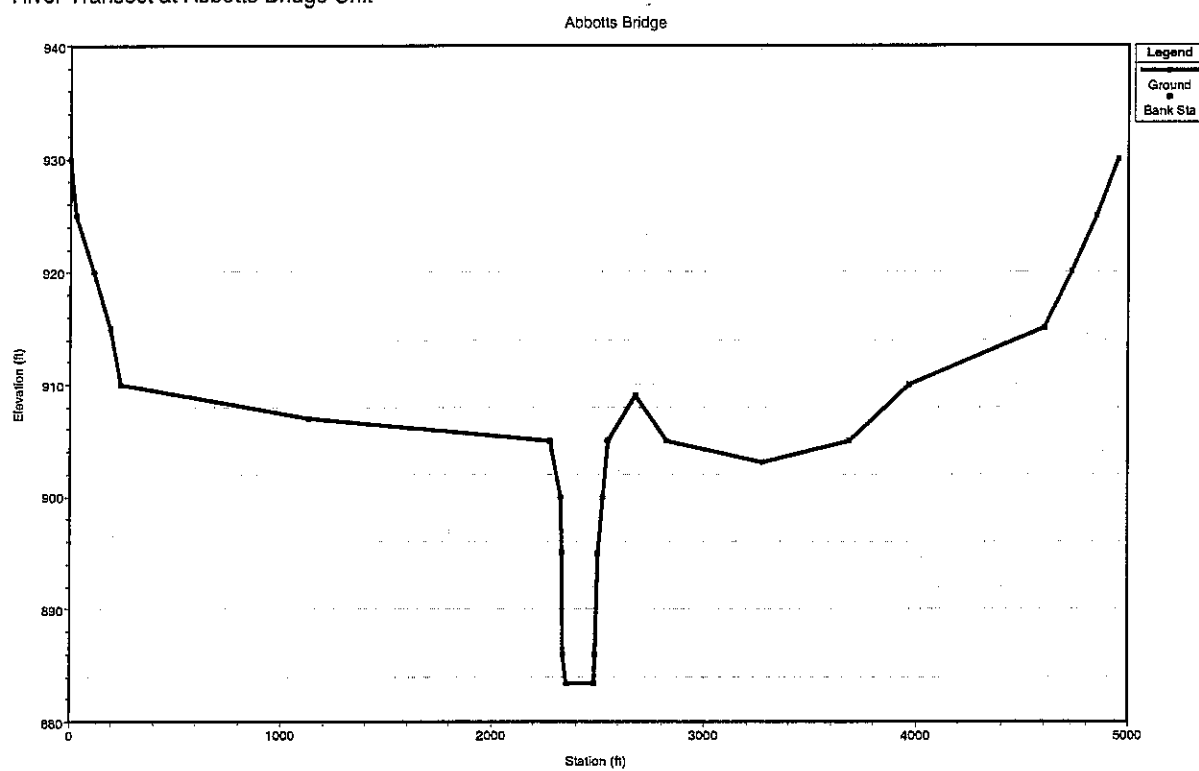


FIGURE A-4
River Transect at Jones Bridge Unit

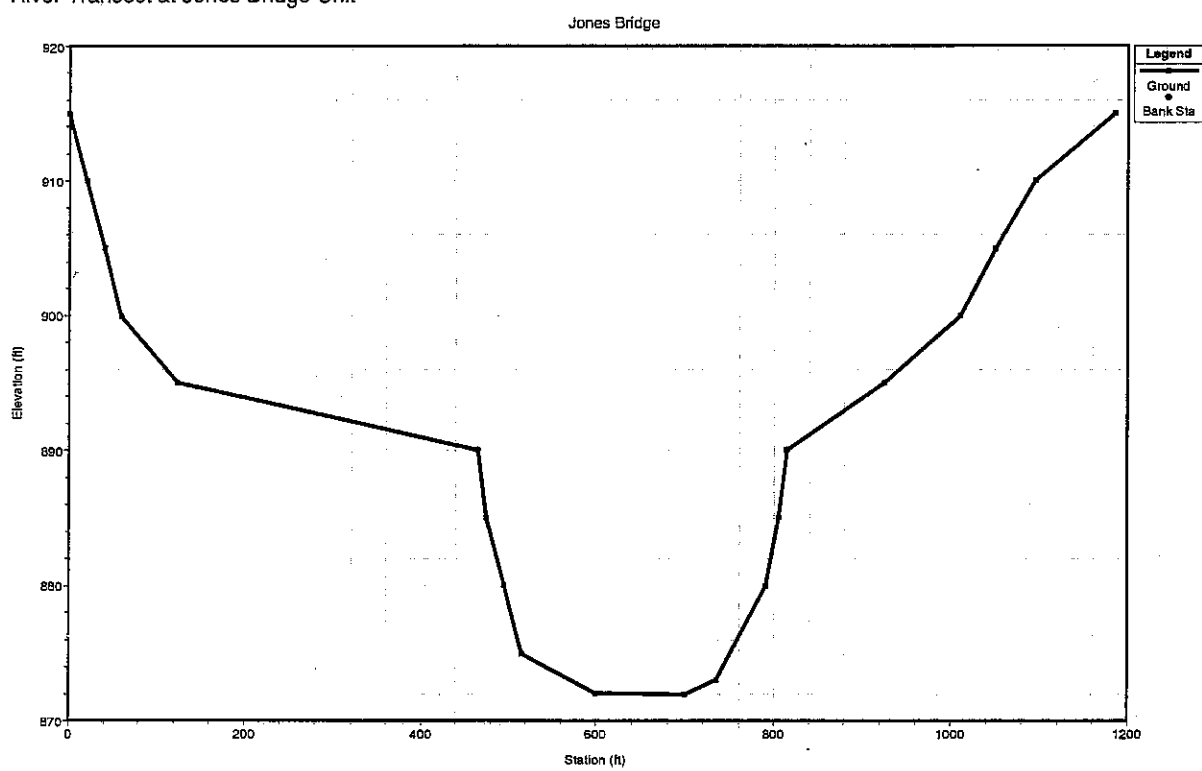


FIGURE A-5
River Transect at Island Ford Unit

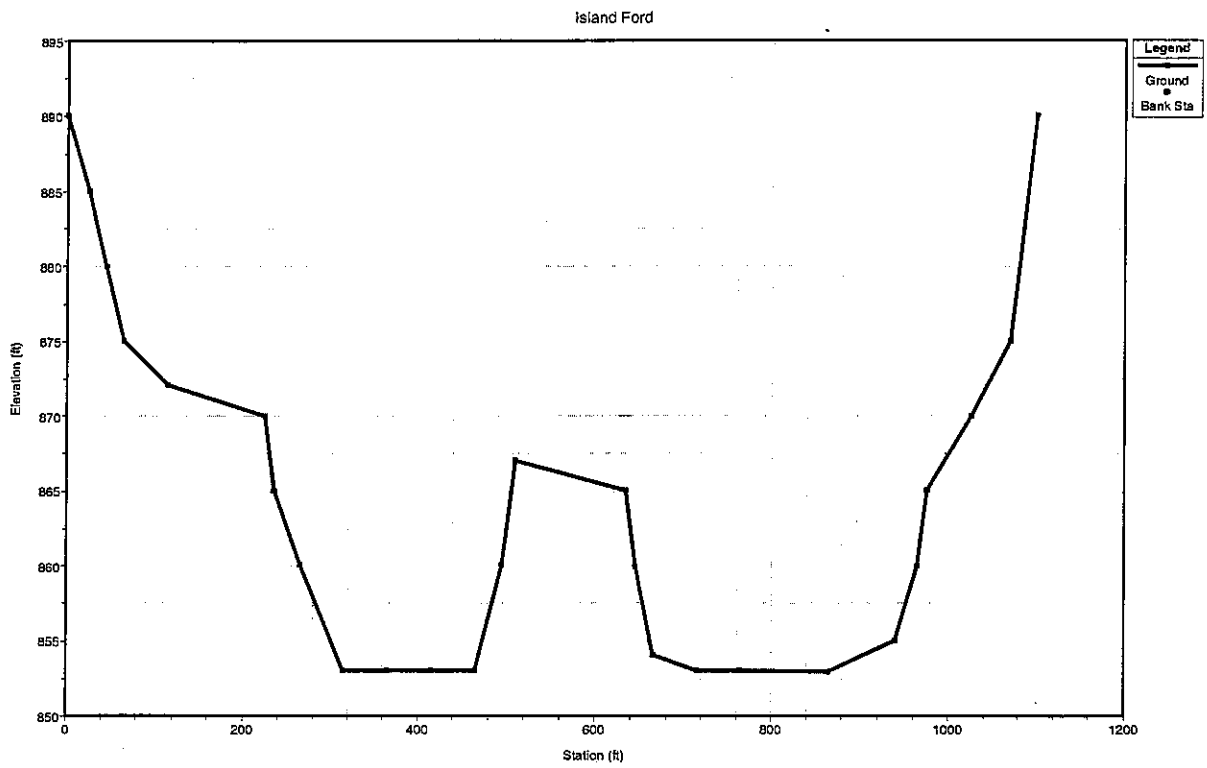


FIGURE A-6
River Transect at Chattahoochee River Park

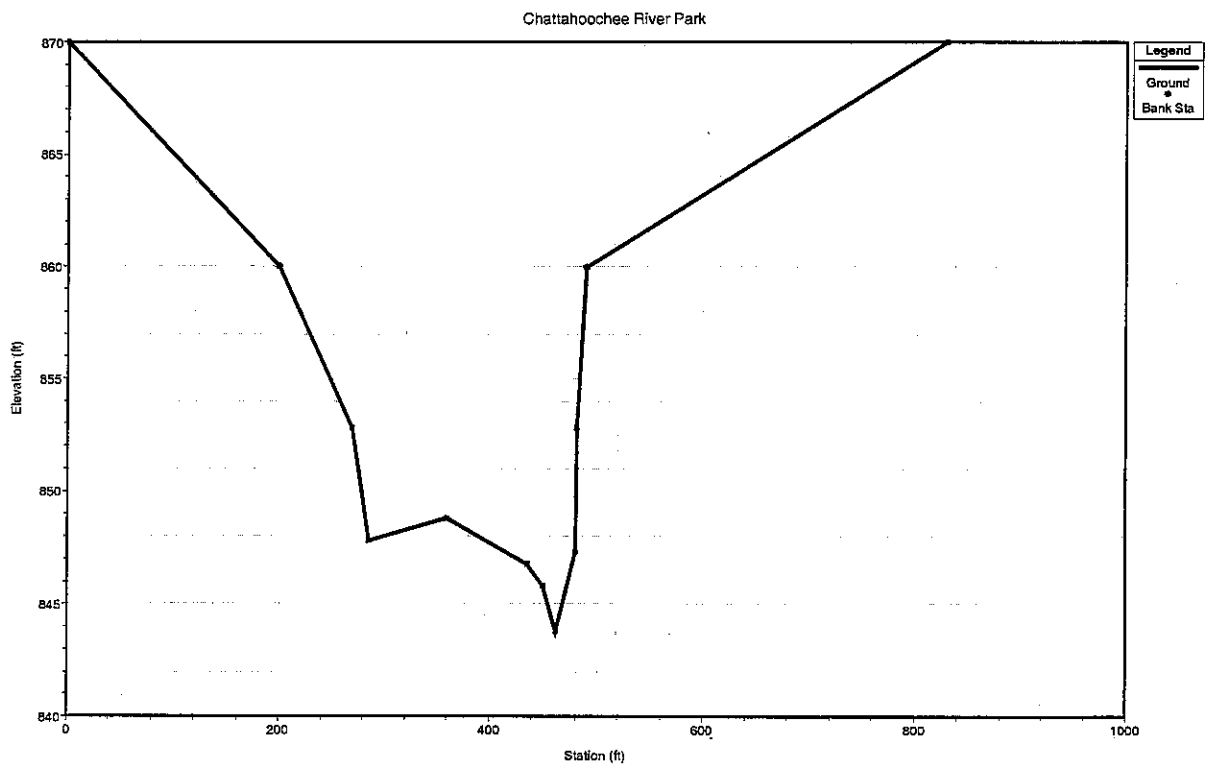


FIGURE A-7

River Transect at Cochran Shoals / Powers Island Unit -

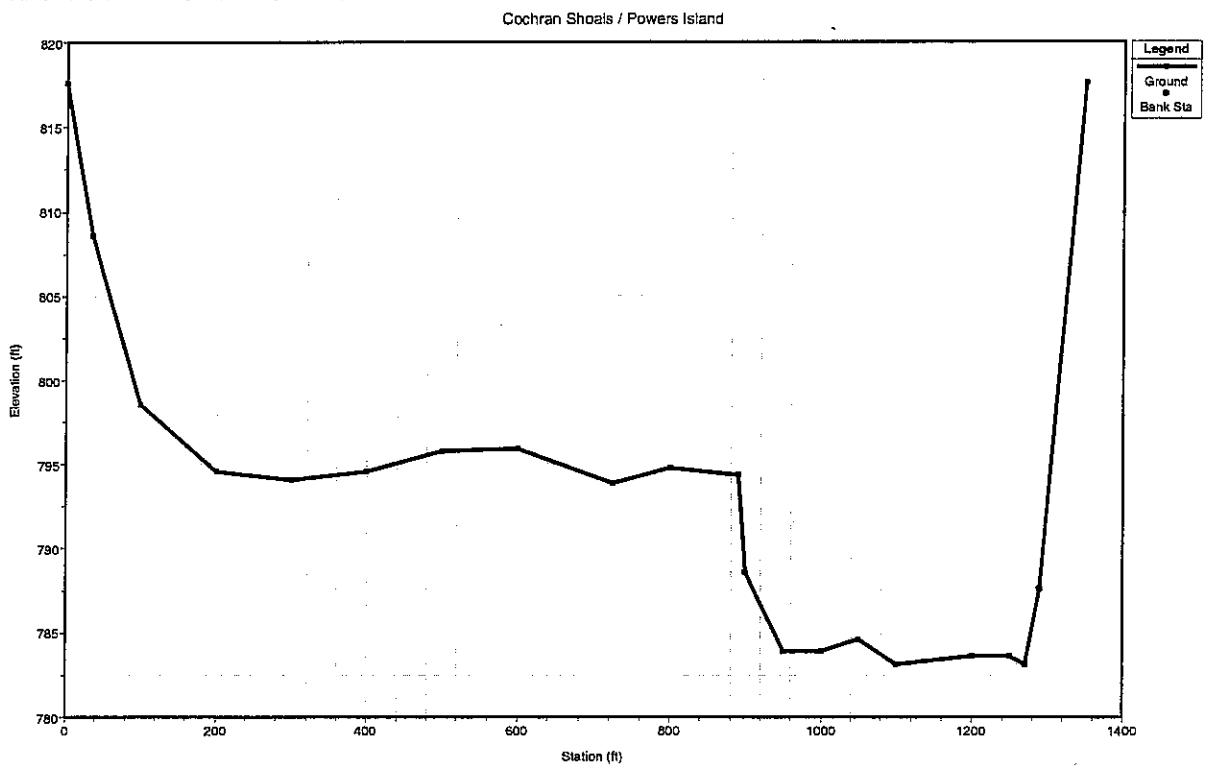
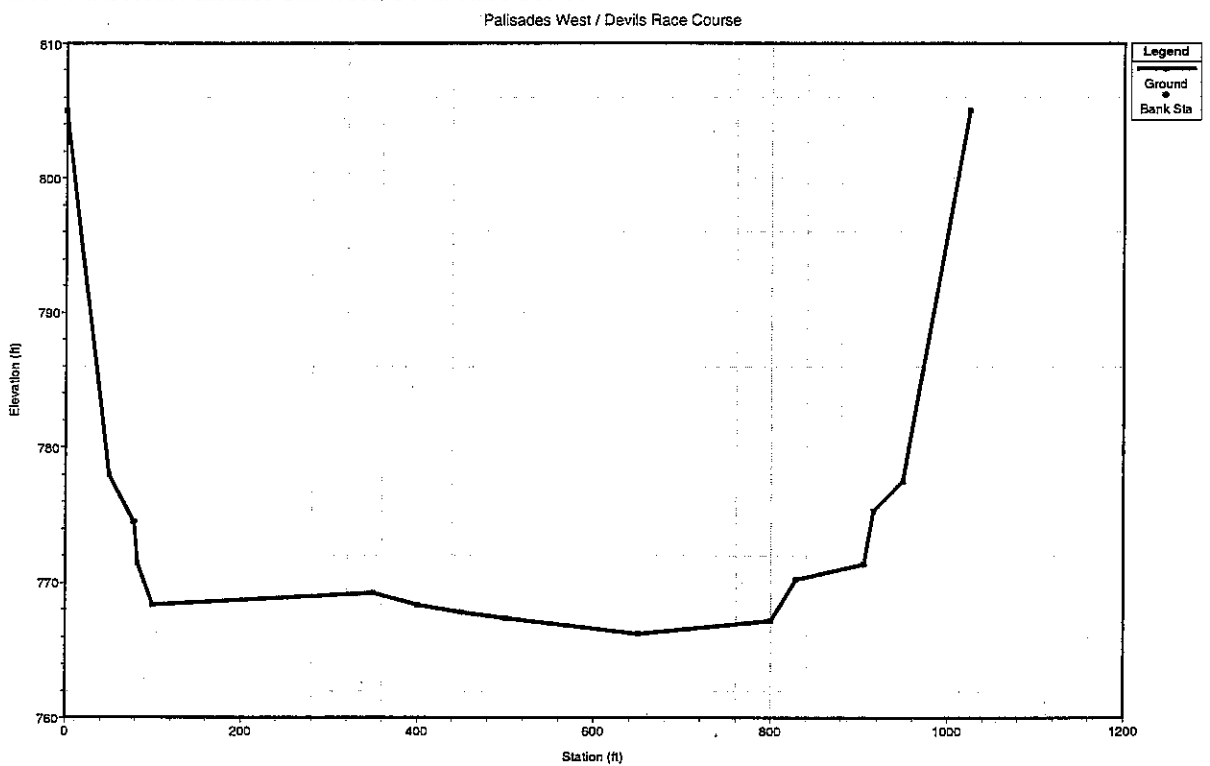


FIGURE A-8

River Transect at Palisades Unit West / Devils Race Course



Appendix B – Video Flow Observation Tables

TABLE B-1
Power Boat Fishing Preferences
Comment Evaluation Form—Flow Observation Points Video Presentation

Location #	Park Unit	Excellent	Very Good	Good	Fair	Poor	Total
1	Bowmans Island Unit						
	Low Flow	1	1			1	3
	Medium Flow	1	1			1	3
	High Flow	1				2	3
2	Settles Bridge						
	Low Flow	1	1		1		3
	Medium Flow	1		1		1	3
	High Flow	1				2	3
3	Abbotts Bridge Unit						
	Low Flow	2	1				3
	Medium Flow	1		1		1	3
	High Flow	1				2	3
4	Jones Bridge Unit						
	Low Flow	1	1	1			3
	Medium Flow	1	1			1	3
	High Flow	1				2	3
5	Island Ford Unit						
	Low Flow	1		1		1	3
	Medium Flow	1	1		1		3
	High Flow	1				1	2
6	Chattahoochee River Park						
	Low Flow	1		2			3
	Medium Flow	2	1				3
	High Flow	2			1		3
7	Powers Island Unit						
	Low Flow	1		1		1	3
	Medium Flow	2	1				3
	High Flow	1	2				3
8	Palisades Unit (Devils Race Course)						
	Low Flow	1			1	1	3
	Medium Flow	2		1			3
	High Flow	2		1			3

Note: The number in each column represents the number of individuals who evaluated the flow relative to the park unit. For example, 2 people thought the medium flow at Powers Island was excellent for power boat fishing.

TABLE B-2
Wade and Tube Fishing Preferences
Comment Evaluation Form—Flow Observation Points Video Presentation

Location #	Park Unit	Excellent	Very Good	Good	Fair	Poor	Total
1	Bowmans Island Unit						
	Low Flow	5	3	1	2	1	12
	Medium Flow	1	2	2		8	13
	High Flow	1			1	11	13
2	Settles Bridge						
	Low Flow	6	1	4	1		12
	Medium Flow	1		3	2	7	13
	High Flow	1				12	13
3	Abbotts Bridge Unit						
	Low Flow	6	3	2	1		12
	Medium Flow	1		4	1	6	12
	High Flow	1			1	9	11
4	Jones Bridge Unit						
	Low Flow	7	3	3			13
	Medium Flow	1	1	3	3	5	13
	High Flow	1			2	10	13
5	Island Ford Unit						
	Low Flow	6	2	4		1	13
	Medium Flow	1	2	5	3	2	13
	High Flow	1		1	5	6	13
6	Chattahoochee River Park						
	Low Flow	5	1	6	1		13
	Medium Flow	2	2	5	3	1	13
	High Flow	2	1	2	7	1	13
7	Powers Island Unit						
	Low Flow	5	3	4		1	13
	Medium Flow	2	4	5		1	12
	High Flow	1	4	4	2	1	12
8	Palisades Unit (Devils Race Course)						
	Low Flow	5	1	2	2	2	12
	Medium Flow	3	2	4	2	1	12
	High Flow	2	3	3	3	1	12

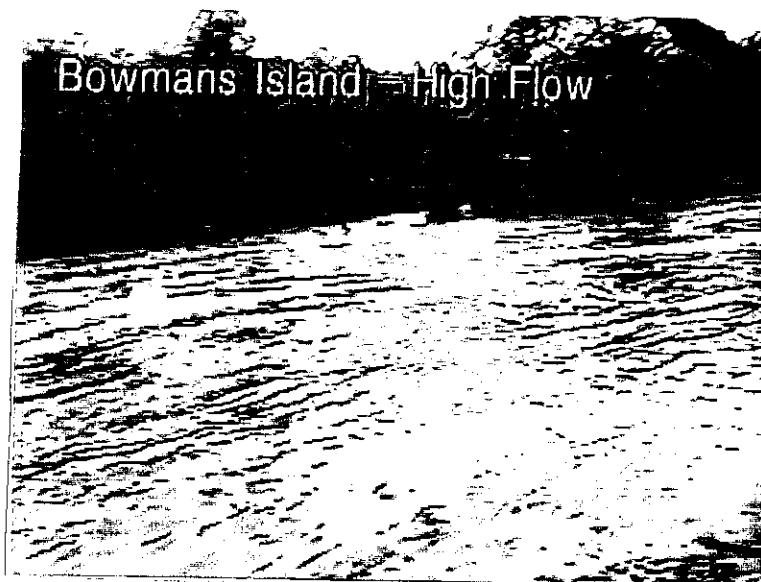
Note: The number in each column represents the number of individuals who evaluated the flow relative to the park unit. For example, 5 people thought the low flow at Powers Island was excellent for wade or tube fishing.

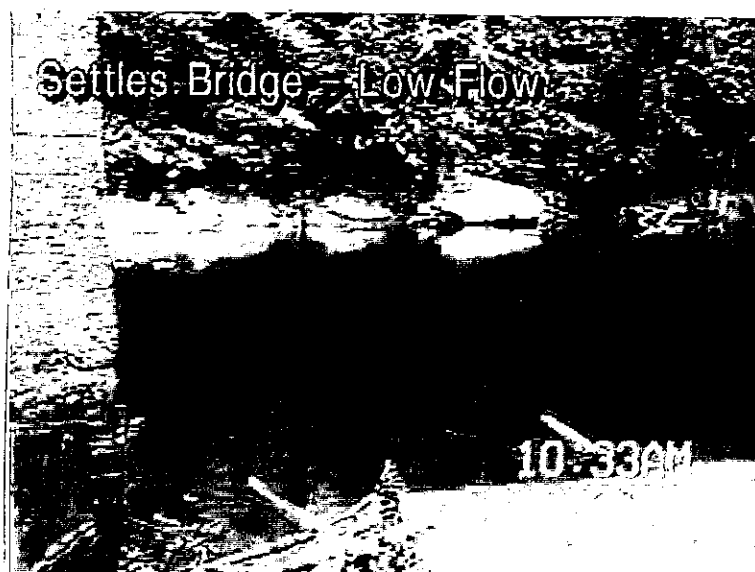
TABLE B-3
Rowing, Paddling and Rafting Preferences
Comment Evaluation Form—Flow Observation Points Video Presentation

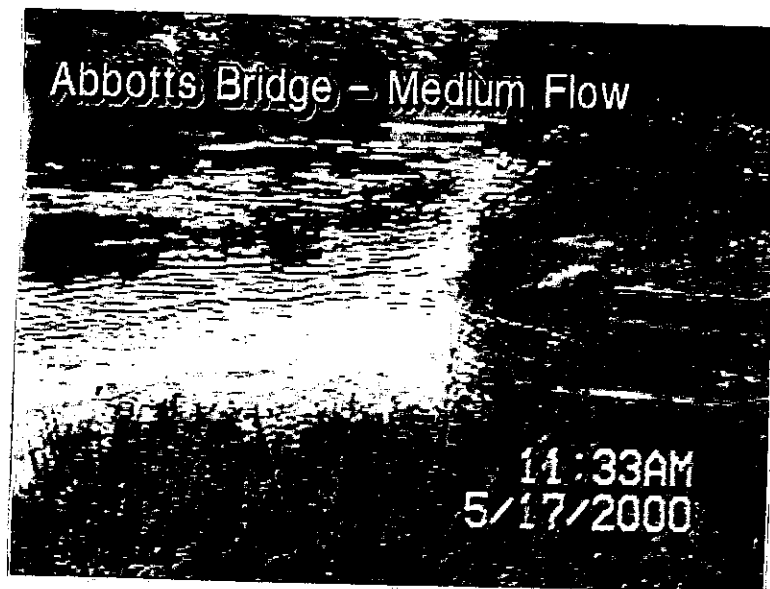
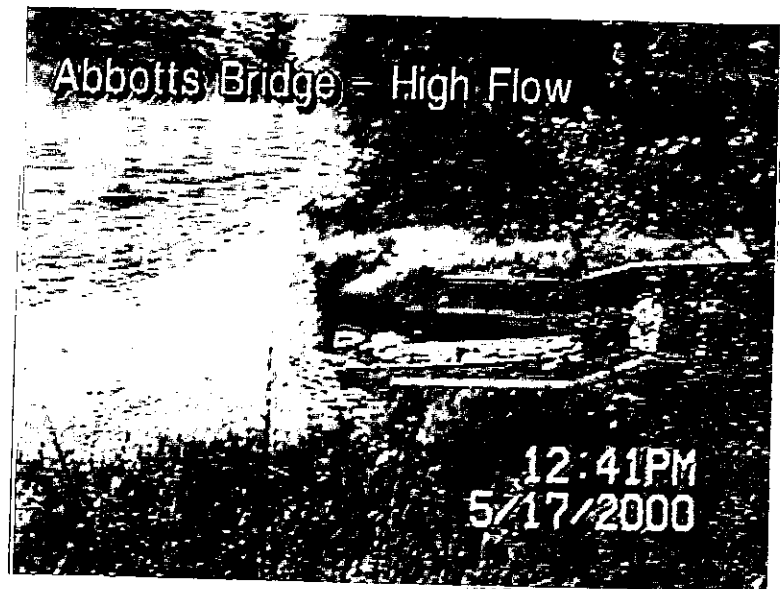
Location #	Park Unit	Excellent	Very Good	Good	Fair	Poor	Total
1	Bowmans Island						
	Low Flow		1		3	2	6
	Medium Flow		2	3	1		6
	High Flow			2	4		6
2	Settles Bridge						
	Low Flow			1	3	2	6
	Medium Flow	1		4	1		6
	High Flow		2	3	1		6
3	Abbotts Bridge						
	Low Flow			2	2	2	6
	Medium Flow		1	3	1	1	6
	High Flow		2	2	2		6
4	Jones Bridge						
	Low Flow		1	1	3	2	7
	Medium Flow		2	2	2	1	7
	High Flow	1	3		2	1	7
5	Island Ford						
	Low Flow		1	2	3	1	7
	Medium Flow		1	4	2		7
	High Flow	1	1	3	2		7
6	Chattahoochee River Park						
	Low Flow			1	5	4	10
	Medium Flow	1	1	4	2	2	10
	High Flow	3	1	4	1	1	10
7	Powers Island						
	Low Flow		2		3	2	7
	Medium Flow		1	3	2	1	7
	High Flow	1	1	1	3	1	7
8	Palisades/Devils Race Course						
	Low Flow			1	4	2	7
	Medium Flow		1	3	1	2	7
	High Flow	1	2	2	1	1	7

The number in each column represents the number of individuals who evaluated the flow relative to the park unit. For example, 2 people thought the low flow at Powers Island was very good for rowing, paddling or rafting.

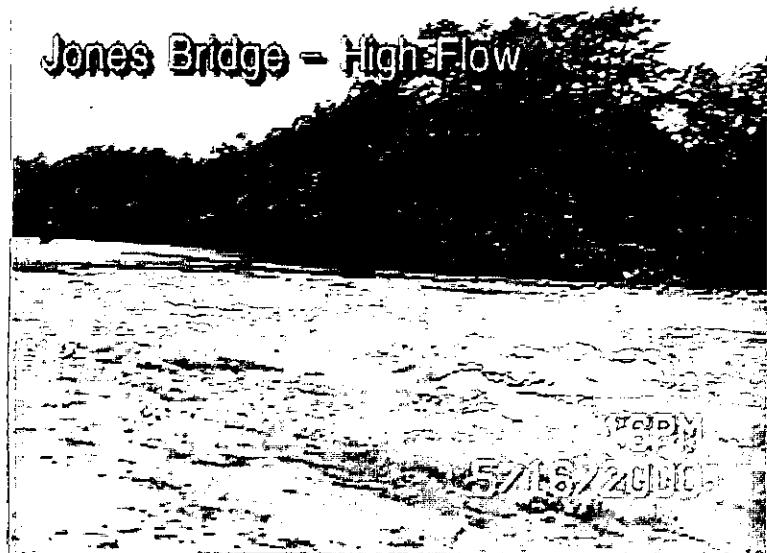
Appendix C – Video Observation Point Photographs







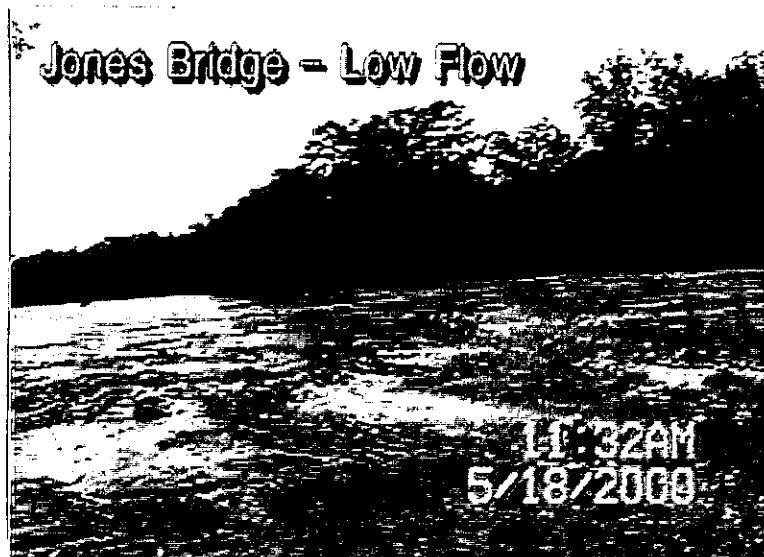
Jones Bridge - High Flow

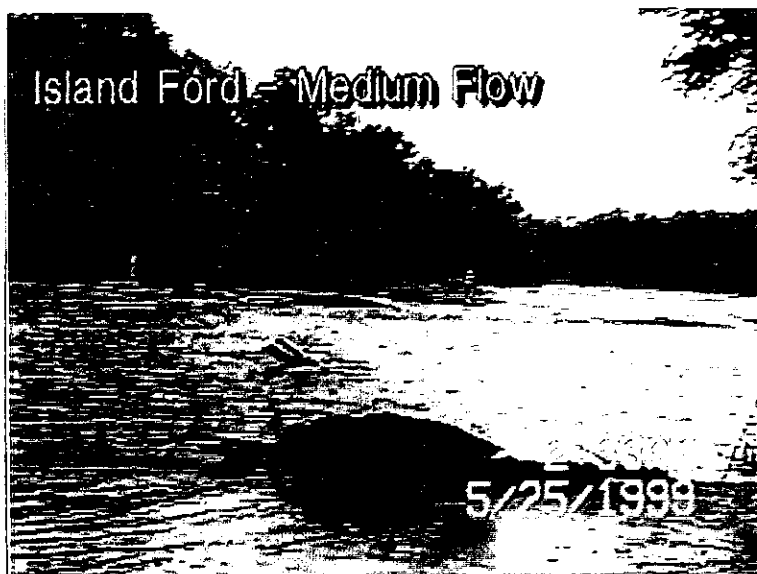
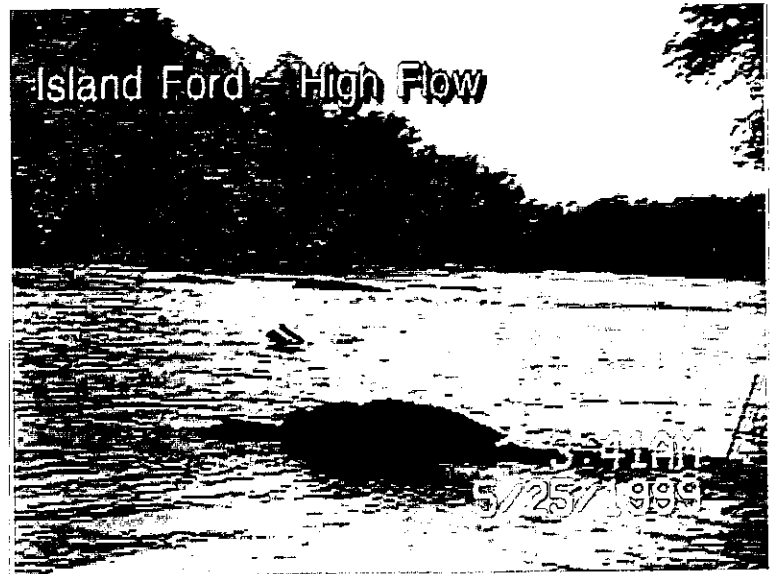


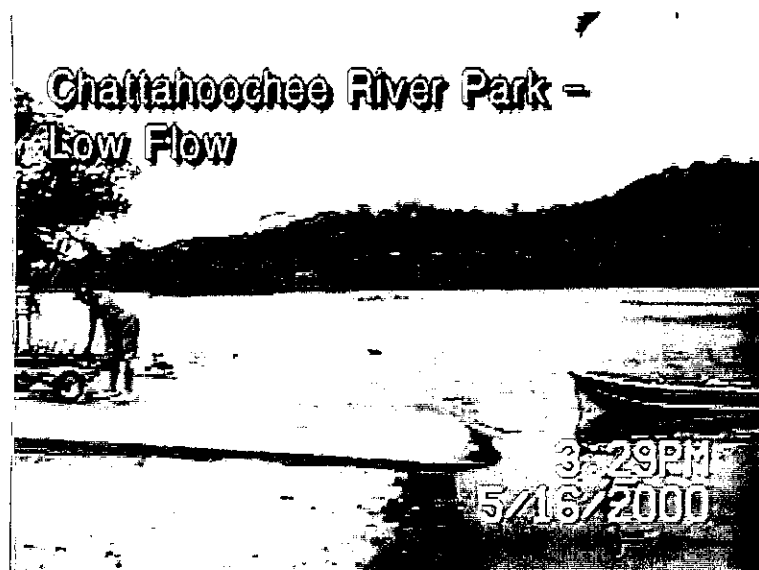
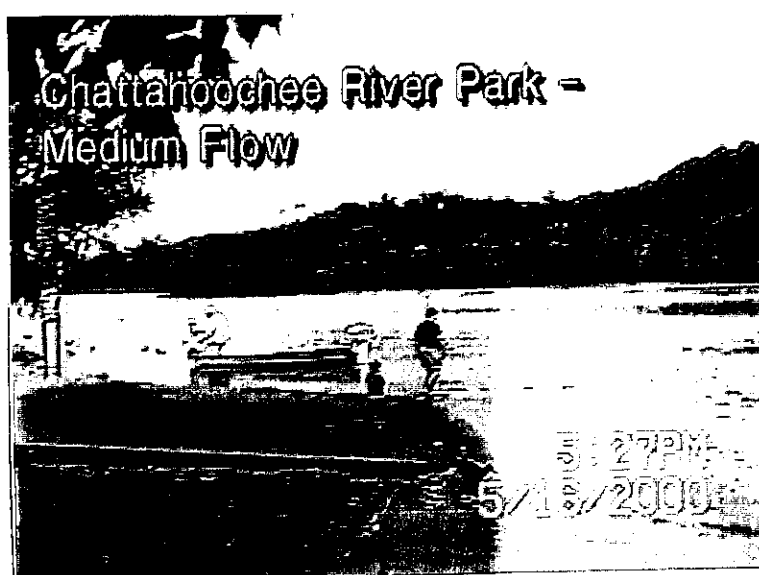
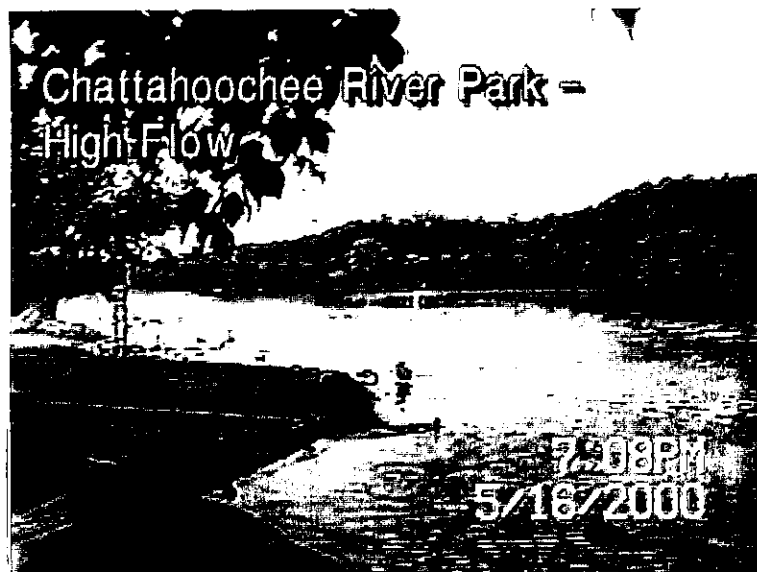
Jones Bridge - Medium Flow

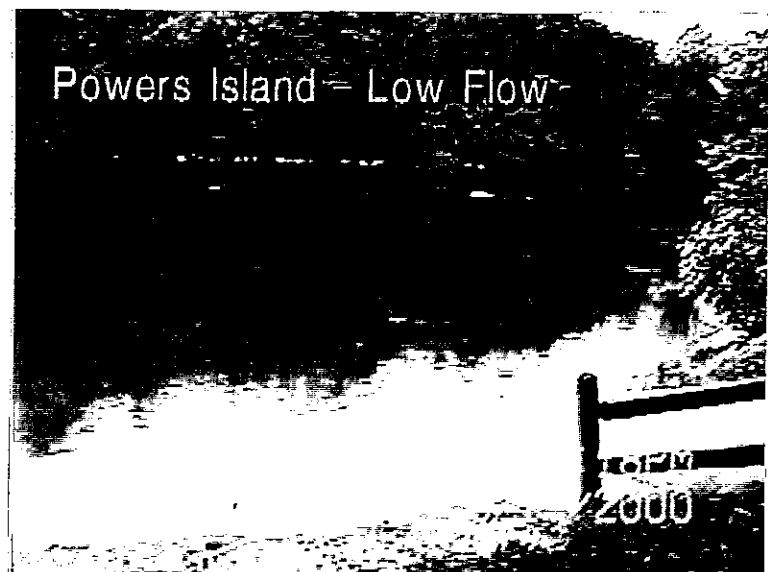
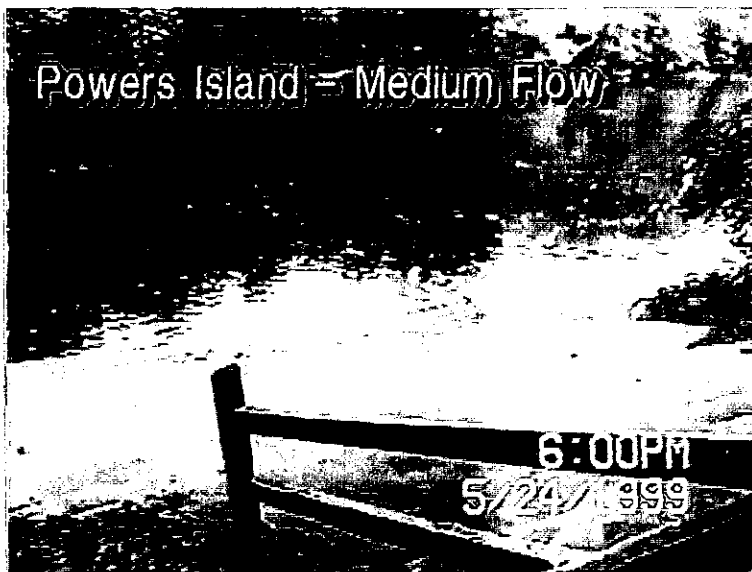
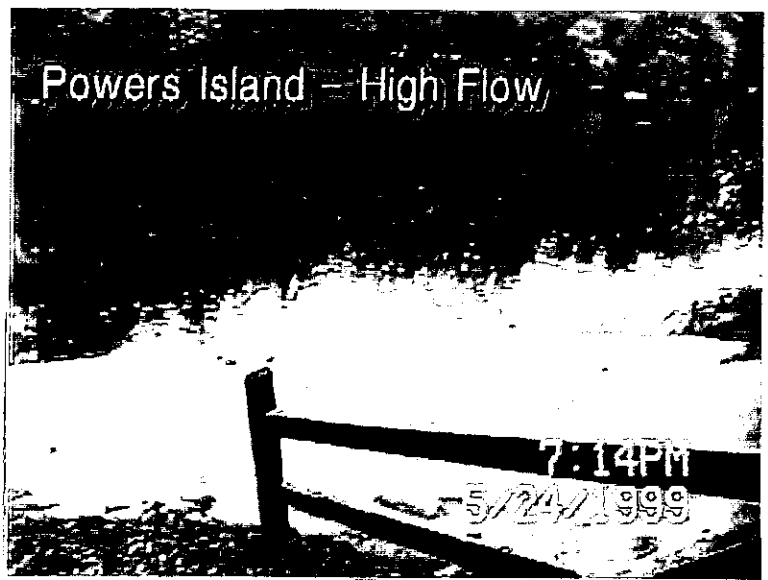


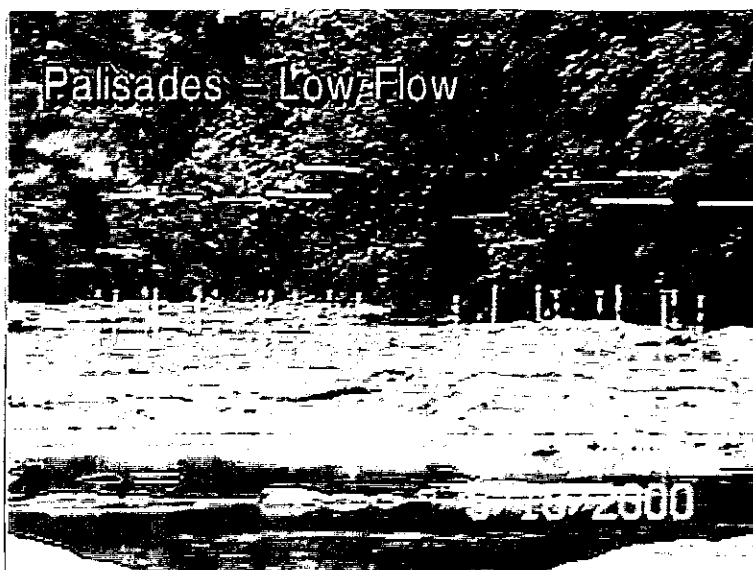
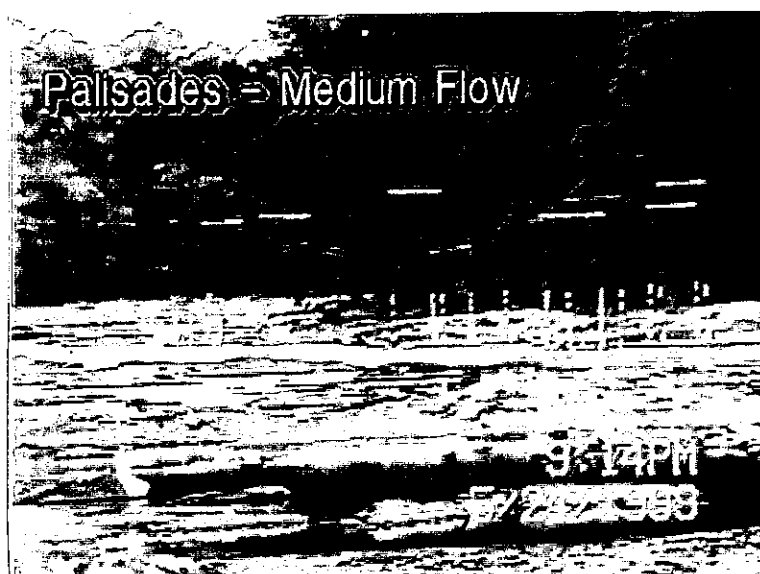
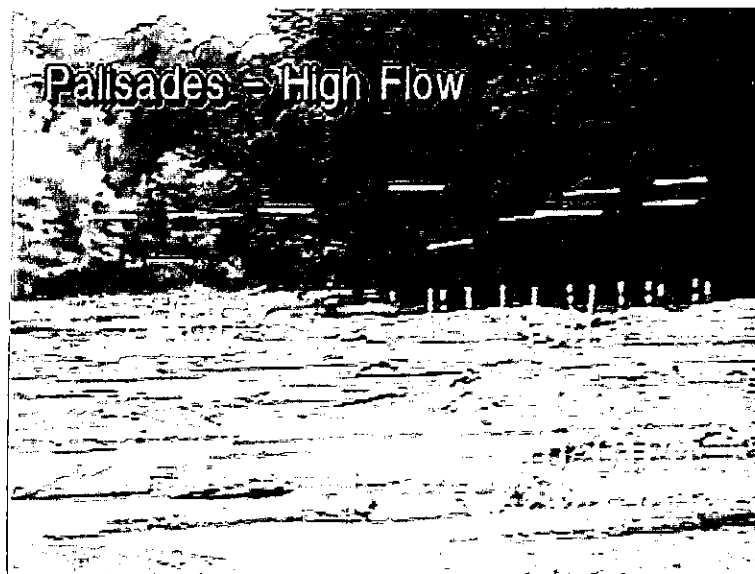
Jones Bridge - Low Flow











Palisades Unit (Devils Race Course)
Video Observation Point Photos
CRNRA Recreation Flow Preference Study